

To order this manual, use Part Number 9508-0208.

Revision History		
Revision	Description	Date
A	Initial Release	
B	Revised	
C	Rev/Firmware V 4.10	1/96
D	Formatted for product	1/96
E	Converted/updated V 4.30	10/99

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When you return an instrument to *OHD*, for service, repair, or calibration, we recommend using United Parcel Service, Federal Express, or Air Parcel Post. We also recommend that you insure your shipment for its actual replacement cost. *OHD* will not be responsible for lost shipments or instruments that are received in damaged condition due to improper packaging or handling. All warranty claim shipments must be made on a freight prepaid basis. Also, in order to expedite your claim, please include a properly completed copy of the Service Return Form. Recalibration of instruments, which have a recommended annual calibration frequency, is not covered under the warranty.

Use the original carton and packaging material for shipment. If they are not available, we recommend the following guide for repackaging:

- Use a double-walled carton of sufficient strength for the weight being shipped.
- Use heavy paper or cardboard to protect all instrument surfaces. Use nonabrasive material around all projecting parts.
- Use at least four inches of tightly packed, industrial-approved shock-absorbent material around the instrument.

Warranty Disclaimer

Should you elect to have your instrument serviced and/or calibrated by someone other than *OHD*, please be advised that the original warranty covering your product becomes void when the tamper-resistant Quality Seal is removed or broken without proper factory authorization. We strongly recommend, therefore, that you send your instrument to *OHD* for factory service and calibration, especially during the original warranty period. In all cases, breaking the tamper-resistant Quality Seal should be avoided at all cost, as this seal is the key to your original instrument warranty. In the event that the seal must be broken to gain internal access to the instrument (e.g., in the case of a customer-installed firmware upgrade), you must first contact *OHD* technical support department at 205-980-0180. You will be required to provide us with the serial number for your instrument as well as a valid reason for breaking the Quality Seal. You should break this seal only after you have received factory authorization. Do not break the Quality Seal before you have contacted us! Following these steps will help ensure that you will retain the original warranty on your instrument without interruption.

WARNING

Unauthorized user modifications or application beyond the published specifications may result in electrical shock hazards or improper operation. *OHD* will not be responsible for any injuries sustained due to unauthorized equipment modifications.

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The FitTester 3000 AND ITS FEATURES

Introduction

The FitTester 3000 measures...

Face-to-facepiece fit of a respirator. With a perfect respirator and fit, all inhaled air is forced through the filter system, thereby providing maximum respiratory protection for the individual. If the face-to-facepiece seal leaks, unfiltered air bypasses the filter system and enters the individual's lungs during inhalation, thus reducing respiratory protection.

By design, a respirator should prevent contaminated air from entering the lungs of the individual wearing it. If the respirator is in good working order, the only way contaminated air can enter the individual's lungs is through a leak in the face-to-facepiece seal. The *FitTester 3000* measures face-to-facepiece seal leakage and then calculates the fit factor (FF) of the respirator being tested.

The FitTester 3000 uses...

The patented *Controlled Negative Pressure (CNP)* technology. An adapter configured with a squeeze-bulb-actuated valve replaces the filter cartridge and inhalation valve on the respirator.* The individual under test dons the respirator (in accordance with Association National Standards Institute [ANSI] guidelines or manufacturer's instructions), takes a breath, holds the breath, squeezes the bulb to close the adapter valve, and begins the test.

** The inhalation valve must be removed or propped open for the fit test.*

The FitTester 3000 follows...

A set procedure, or a protocol. Each protocol consists of 1 to 18 steps (a step is either a fit test or an exercise).

NOTE 1:

Refer to PROTOCOLS, TEST AND PROTOCOL RESULTS, and PARAMETERS (see Index).

NOTE 2:

Some regulatory agencies require a defined procedure or protocol.

ACCESSORIES

STANDARD ACCESSORIES	
<i>Description</i>	<i>Part</i>
Squeeze-Bulb Assembly	9503-0024
Dual Tube Assembly #2	9503-0069
Power Cord	3010-0055
9- to 25-pin "AT" RS-232 Null Modem Cable	3010-0441
Operating Manual	9508-0208
Vinyl Accessory Pouch	9530-0030

Five quick-disconnect adapters

FLOW

Female quick-disconnect adapter on the front panel that connects to the dual tube assembly. See *Preparing the FitTester 3000 for Testing (4. Dual Tube Assembly Connection)*.

PRESSURE

Male quick-disconnect adapter on the front panel that connects to the dual tube assembly. See *Preparing the FitTester 3000 for Testing (4. Dual Tube Assembly Connection)*.

EXHAUST

Male quick-disconnect adapter on the rear panel. **DO NOT CONNECT ANYTHING TO THIS PORT!**

DUAL TUBE CHECK

Two male quick-disconnect adapters on the front panel. See the *SYSTEM MENU, Dual Tube Calibration*.

Two knobs

VOLUME

Rotate this knob to increase and decrease the volume.

VIEW

Rotate this knob to change the contrast of the viewing screen.

3. TEST ADAPTERS

- Replace the respirator's filter cartridge (or cartridges) with the appropriate test adapter (or adapters).

NOTE:

See MECHANICAL INTERFACES on page 13 for details about the test adapters.

4. DUAL TUBE ASSEMBLY CONNECTION

- First, attach the dual tube assembly (Part # 9503-0069) to the front of the *FitTester 3000*. Use the end of the dual tube assembly that has one male quick-disconnect adapter and one female quick-disconnect adapter.
- Connect the male quick-disconnect adapter of the dual tube assembly to the female quick-disconnect adapter labeled FLOW.
- Connect the female quick-disconnect adapter of the dual tube assembly to the male quick-disconnect adapter labeled PRESSURE.
- Next, calibrate the dual tube assembly. Connect the two female quick-disconnect adapters on the dual tube assembly to either of the male quick-disconnect adapters on the *FitTester 3000* front panel labeled DUAL TUBE CHECK. Follow the *Dual Tube Calibration* procedure in the *SYSTEM MENU* section.

NOTE:

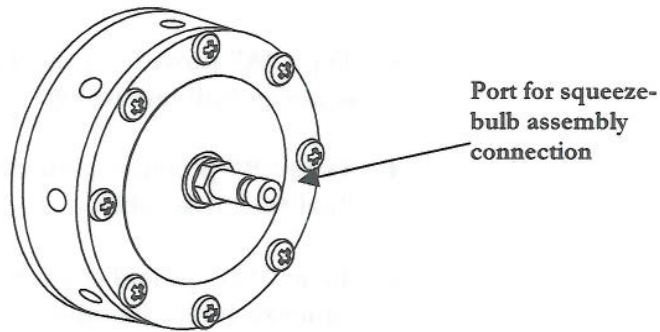
OHD recommends that you perform a dual tube calibration before:

- 1) beginning a fit-test session, at the start of the day.
- 2) after using a different dual tube assembly.

- Finally, connect the two female quick-disconnect adapters (again, orientation does not matter) to the two male quick-disconnect adapters on the test adapter that is on the respirator. One tube monitors the pressure inside the respirator mask, and the other tube removes air from the respirator mask at a controlled rate.

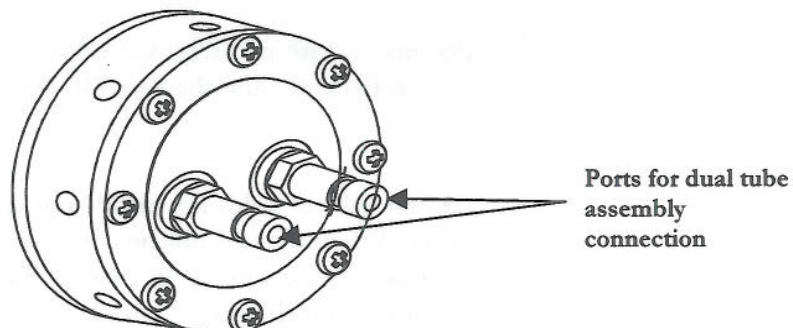
Type "A" Test Adapter

The type "A" test adapter has one port that provides pneumatic control of the test adapter valve. This valve is closed by squeezing and holding the bulb during a fit test to prevent air flow. When the valve is opened, a breathing path is created for the test subject.



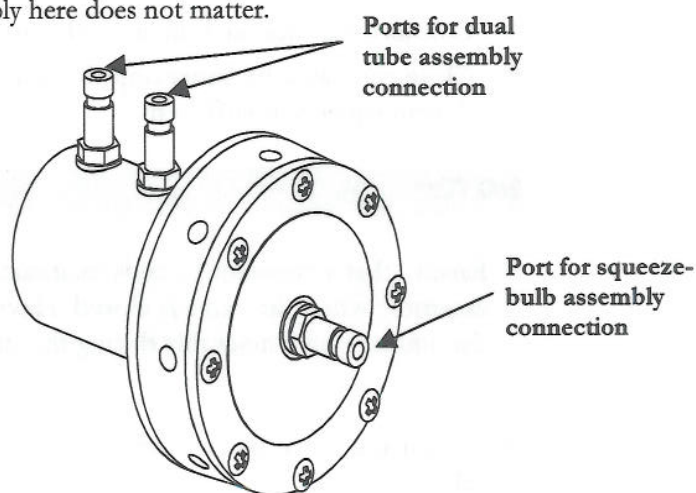
Type "B" Test Adapter

The type "B" test adapter has two ports. One port monitors the pressure inside the respirator mask, and the other port removes air from the respirator mask at a controlled rate. These ports connect to the dual tube assembly. Orientation of connectors here does not matter.



Type "AB" Test Adapter

The type "AB" test adapter has three ports. The ports connect to the squeeze-bulb assembly and to the dual tube assembly. Orientation of the dual tube assembly here does not matter.



Fit Factor

The ratio of the modeled breathing rate to the measured leak rate is the calculated fit factor and is expressed by the following equation.

$$\text{fit factor (FF)} = \frac{\text{modeled breathing rate (MBR)}_{(cc/min)}}{\text{measured leak rate (MLR)}_{(cc/min)}}$$

The modeled breathing rate (MBR)* is the rate at which an individual breathes, predetermined for the standard protocols. The MBR is calculated from the parameters specified by the operator for custom protocols: The operator-specified parameters are inspiratory work rate, respirator mask type, cartridge type, and test subject's gender.

The measured leak rate (MLR) is directly related to facepiece fit. It is from the leak rate measurement that all fit factor calculations are made. The leak rate is specified in cubic centimeters per minute (cc/min).

Simply stated, the fit factor is the inverse of the percentage of air inhaled as a result of the leak.

* A feature unique to the FitTester 3000 is its ability to change the modeled breathing rate in order to challenge the mask at different negative pressures. This allows the user to replicate different or extreme circumstances in the real work environment. By varying the negative pressure, the user can "challenge" or test the mask under varying stress load conditions, and discover how fit will be affected under those loads. The setting of these parameter options is discussed in the PARAMETERS section of Protocol Chapter.

NOTE:

The conservative fit factor of the *FitTester 3000* is equivalent by definition to fit factors obtained by traditional quantitative fit-test methods (that is, aerosol methods). The direct leakage measurement of the *FitTester 3000* is superior to the aerosol approximation methods, because the leakage measurement isn't dependent on aerosol in mask particle accuracy problems, including collection and counting. The *FitTester 3000* leak measurement system uses air, not aerosols; therefore, it eliminates mixing and all other related problems associated with quantitative aerosol measurement methods.

Power-On and Menu Navigation

The power-on/off switch is located adjacent to the power cord plug on the rear panel of the *FitTester 3000*.

IMPORTANT POINTS

Use the → or ← key to change *Main MENUS*

Use the ↑ or ↓ key to change *Test MENUS*

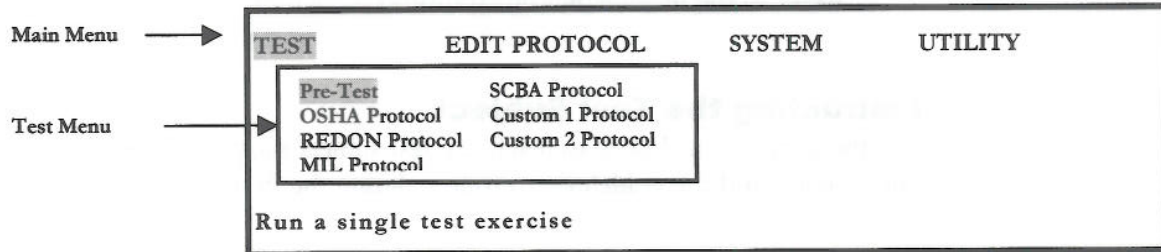


Use the key to return to the previous menu. Press repeatedly and you will return to Main Menu



Press the key to accept the selection highlighted on the menu once

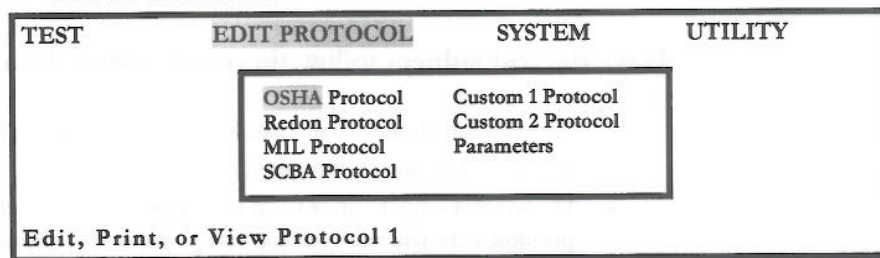
When you turn on the instrument, the current firmware version is displayed, followed by the **Main Menu** and the **Test Menu**, as shown below:



NOTE:

The Pre-Test menu routine on the TEST MENU is active first.

- ☐ Press the → key and the display shows the MAIN MENU and the EDIT PROTOCOL MENU:



- ✓ Refer to the Protocols section for more information on viewing, editing, or printing a Protocol.
- ✓ Refer to the Parameters section for more information on viewing, editing, or printing a Parameter.
- ✓ Refer to the Pre-Test section for more information on "how to" run a pre-test.

Start-up Procedure

The following start-up procedure will validate the correct operation and calibration of the *FitTester 3000* and ensure that measurements are within tolerance.

Daily Procedure

Each day the *FitTester 3000* is to be used, the operator should use the following procedure:

- 1) Power on the *FitTester 3000* using the toggle switch.
- 2) From the UTILITY MENU, verify that the printer is in the AVAILABLE mode
- 3) From the SYSTEM MENU, run the ZERO PRESSURE function.
- 4) From the SYSTEM MENU, run the DUAL TUBE CAL procedure.
- 5) SAVE the successful calibration.
- 6) Print the calibration report (optional).
- 7) Proceed to TEST MENU and begin testing.

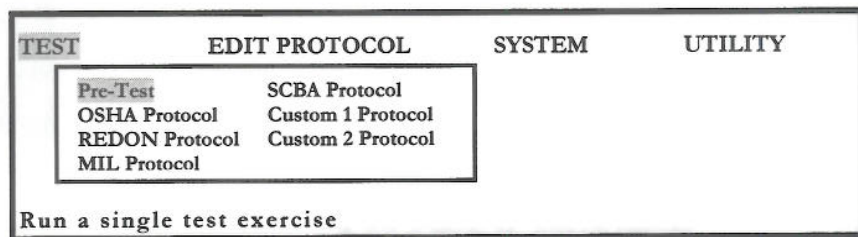
When Replacing Dual Tube

Follow steps 3 through 7 in DAILY PROCEDURE (above).

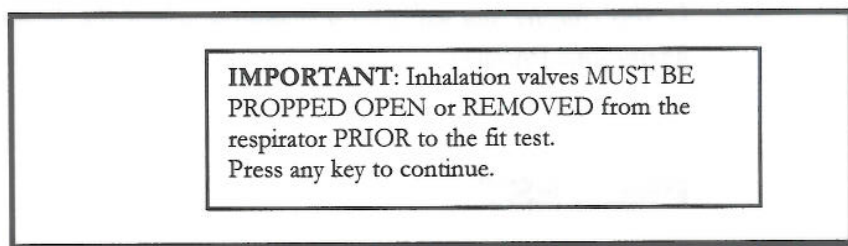
Function Key Operation

While in the HELP program, the function keys operate as indicated below.

Esc	Escape	Returns to the active menu routine.
F1	HOME	Returns to the beginning of the HELP section for the active menu routine.
F2	START	Moves to the beginning of the HELP program.
F3	Prev	Moves back to the Previous section.
F4	Next	Moves forward to the Next section.
F5	<i>Inactive</i>	<i>Inactive</i>
Ent	<i>Inactive</i>	<i>Inactive</i>
↑	Up arrow	Moves up one line
↓	Down arrow	Moves down one line.
←	<i>Inactive</i>	<i>Inactive</i>
→	<i>Inactive</i>	<i>Inactive</i>

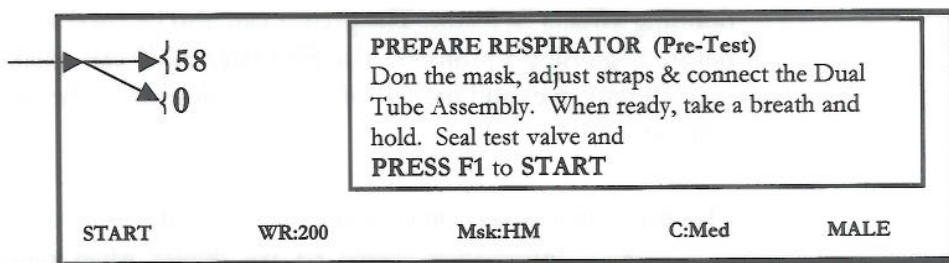


☐ Next, press the F1 key, and the display shows:



- Press any key to continue, and the display looks like this:

Challenge pressure
and respirator mask
pressure



The two numbers in the upper left corner of the above-illustrated display indicate the challenge pressure and respirator mask pressure.

The **challenge pressure** (58, above) is located immediately above the **respirator mask pressure** (0, above). See next page for details about these pressures and the parameters.

NOTE:

Ensure that the respirator mask pressure is 0 before running the pre-test. If the respirator mask pressure is not 0, follow the *Zero Pressure* instructions.

Respirator Mask Pressure

The *FitTester 3000* monitors the respirator mask pressure via the PRESSURE port (located on the front panel).

The respirator mask pressure appears (in hundredths of an inch of water) below the challenge pressure in the upper left portion of the display.

Pre-Test Parameters

The operator specifies values for four parameters: inspiratory work rate, respirator mask type, cartridge type, and test subject's gender.

These parameter values are used directly in two *FitTester 3000* calculations: modeled breathing rate (which is then used to calculate the fit factor) and challenge pressure.

Before you begin the pre-test, use the function keys listed below to set the parameter values. (*An explanation of each parameter follows this list.*)

NOTE:

Setting the parameter values during the pre-test does not affect the parameter values for the protocol.



WR:

Select the inspiratory work rate.



Msk:

Select the respirator mask type.



C:

Select the cartridge type.



MALE/FEMALE

Select the test subject's gender.

Running the Pre-Test

NOTE:

The *FitTester 3000* checks for correct zero-pressure offset status. If there is a bad zero-pressure offset, the error message “Zero offset is too large. Testing is inhibited” appears. The offset problem must first be corrected before testing can resume. See Zero Pressure for more information.

- ☐ Set parameter values as explained in the previous section PRE-TEST, Pre-Test Parameters.
- ☐ Set the minimum passing fit factor value. Refer to the PARAMETERS section.

NOTE:


Minimum passing fit factor is a parameter for protocols only. When this value is changed for protocols, it affects the pre-test results. Refer to the Pre-Test Results section.

- ☐ Review the *breath-holding* procedure with the test subject.
- ☐ Complete steps 1–4 in *PREPARING THE FitTester 3000 FOR TESTING*.
- ☐ Complete steps 1–5 in *GETTING STARTED, Preparing the Respirator for Fit-Testing*.
- ☐ Have the test subject don the mask and adjust the straps to achieve a good fit.
- ☐ Make sure the test subject is seated or standing comfortably with shoulders facing the *FitTester 3000*.
- ☐ When the test subject is ready, have him take a breath, then squeeze and hold the bulb assembly.

NOTE:

Remind the test subject:

1. to remain as still as possible during the test, and
2. to maintain a constant force on the squeeze bulb.

- ☐ Press the  (START) key to begin the pre-test.
- ☐ There are two beeps. On the second beep, instruct the subject to release the squeeze bulb and to breathe normally and relax.

Pre-Test Results

The pre-test results are illustrated below and on facing page. The results are explained on pages 32 and 33.

If the leak rate of the respirator mask yields a measurable fit factor, the display will look similar to this:

TEST RESULTS			
Fit Factor	=	1408	PASS
Leak Rate	=	75.3	(cc/min)
Test Time	=	8.0	(seconds)
Test - Q	:	GOOD	


NOTE:

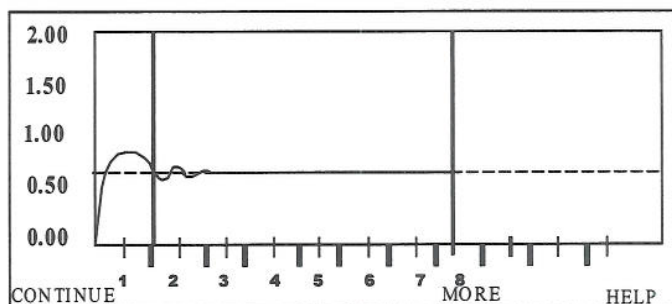
If the leak rate is so great that a fit factor cannot be measured, the display will read "NO FIT (fit factor < x)," where x is the lowest fit factor that can be measured for the particular set of parameters. Repeat the pre-test (see instructions below).


- ☐ Press  (MORE) for additional information as shown below:

TEST RESULTS (Continued)			
Challenge Pressure	=	0.58	(H2O)
Modeled Breathing Rate	=	53.8	(LPM)
Min passing Fit Factor	=	100*	

*To change the minimum passing fit factor, refer to PARAMETERS, Editing Parameters beginning on page 50.

- ☐ Press  (MORE) again, and the pressure trace is shown again:



- ☐ Repeatedly press  (MORE) to scroll through the above displays.

Leak Rate

The next test result is the leak rate. This is directly related to facepiece fit. It is from this leak rate measurement that all fit-factor calculations are made. Leak rate is specified in cc/min.

Test Time

This number represents the time from start to finish during which the subject holds his or her breath. The test time does not exceed 8 seconds. The total test time in seconds appears on the display beneath the "Leak Rate."

Test-Q

The Test-Q, or test quality, is an indication of *acceptability* of the fit-test results. Accurate results depend on a constant pressure being sustained during the test measurement interval.

To achieve a "GOOD Test-Q," the pressure in the mask averaged over the last 1.5 seconds of the test must be within 8% of the target challenge pressure. Large pressure spikes anytime during the test result in a "BAD Test-Q."

Challenge Pressure

Shown in hundredths of an inch of water, the challenge pressure is the pressure at which the leak rate measurement is made. Challenge pressure is explained in the *PRE-TEST, Challenge Pressure* section.

Modeled Breathing Rate

The modeled breathing rate is the rate, in liters per minute, at which an individual breathes under the conditions specified in the protocol.

For Custom 1 and Custom 2 Protocols, the modeled breathing rate is set by the same parameters as the challenge pressure: work rate, respirator mask type, cartridge type, and test subject's gender. The modeled breathing rate is used to calculate the fit factor.

For the OSHA, REDON, MIL, AND SCBA Protocols, challenge pressure and modeled breathing rate are pre-set and hence are unaffected by changes in the parameters.

MIL

The MIL protocol procedure is identical to the REDON above but has a higher stress level than the REDON. The MIL protocol is designed to be used in military applications, where mask stress is high and fit requirements are more critical. This extra measure of protection is expressed in the increased values of:

Challenge Pressure (1.00 in. H₂O)
Modeled Breathing Rate (55.8 l/min.)

SCBA

The SCBA protocol procedure, like the MIL, is identical to the REDON above. It is designed to place the mask under extraordinary stress to be sure the mask can provide protection in life threatening situations where the SCBA is used. This increased exposure protection is better evaluated by values of:

Challenge Pressure (1.50 in. H₂O)
Modeled Breathing Rate (93.1 l/min.)

User Definable Protocols**Custom 1 and 2**

The CUSTOM 1 and 2 protocols are designed to be defined by the user. They consist of up to 18 programmable steps of exercises or test measurements. The parameter values for the tests are determined by the selection of four parameter variables (see PARAMETERS). These protocols provide the user with the option to customize a protocol to meet his specific needs.

Challenge Pressure (VARIABLE in. H₂O)
Modeled Breathing Rate (VARIABLE l/min.)

Running a Protocol

- For a simulated deep breathing exercise, it is recommended that the test subject face forward.
- The *FitTester 3000* shows a decrementing-seconds counter when an exercise is required.
- The *FitTester 3000* checks for correct zero-pressure offset status. If there is a bad zero-pressure offset, the error message "Zero offset is too large. Testing is inhibited" appears. The offset problem must first be corrected before testing can resume. (See *Zero Pressure* for more information.)



IMPORTANT: Inhalation valves **MUST** be
PROPPED OPEN or REMOVED from
the respirator prior to the fit test.
Press any key to continue.

Once you are in either Custom 1 or Custom 2 protocol screens, you can get this screen.


- ☐ Press any key to continue. The display looks similar to this:

Press 58	<table> <tr> <td># STEPS</td> <td>:</td> <td>17</td> <td>03:18:45 pm</td> </tr> <tr> <td>PASS FF</td> <td>:</td> <td>100</td> <td></td> </tr> <tr> <td>MASK TYPE</td> <td>:</td> <td>Full Face</td> <td></td> </tr> <tr> <td>SUBJECT</td> <td>:</td> <td>Male</td> <td></td> </tr> </table>	# STEPS	:	17	03:18:45 pm	PASS FF	:	100		MASK TYPE	:	Full Face		SUBJECT	:	Male	
# STEPS	:	17	03:18:45 pm														
PASS FF	:	100															
MASK TYPE	:	Full Face															
SUBJECT	:	Male															
TEST	MALE	Msk: Hm	OTHER	HELP													

Even though you have set parameter values (in step 1), this step provides the opportunity to make additional changes:

- ☐ Press  to identify the gender of the test subject—male or female.
- ☐ Press  to select the respirator mask type—HM (Half Mask), or FF (Full Face).

NOTE:

Press  to access the HELP program for the protocol.

Refer to GETTING STARTED, Help Program, for details about its operation.

- ☐ Press  to display this.

DEFAULT WR AND CARTRIDGE PARAMETERS			
WORK RATE:		MODERATE (20 Kcal/Hr)	
CARTRIDGE TYPE:		Med (Chem/HEPA)	
SAVE	NO-SAVE	SELECT	CHANGE

TEST AND PROTOCOL RESULTS

There are two types of protocol results: test results and protocol results.

The test results appear on the display only after each test-step is completed.

NOTE:

An exercise-step doesn't have a test result.

The protocol results appear on the display after all test-steps and exercise-steps are completed. The protocol results are a combination of each test-step's test results. From this combination of test results, the FitTester 3000 calculates the "average equivalent fit factor" for the test protocol.

Test Results

Each test result is explained under *PRE-TEST*, *Pre-Test Results*.

If the leak rate of the respirator mask yields a measurable fit factor, the display will look similar to this:

TEST RESULTS				
Fit Factor	=	168	PASS	
Leak Rate	=	632.4	(cc/min)	
Test Time	=	8.0	(seconds)	
— — — — —				
SAVE	RETRY	ABORT	MORE	HELP

NOTE:

If the leak rate is so great that a fit factor cannot be measured, the display will read "NO FIT (fit factor < x)," where x is the lowest fit factor that can be measured for the particular set of parameters. You have several options that are explained on the next page.

- When you press **F3** (**ABORT**), the display shows the following:

EXIT THE TEST?

ESCAPE = EXIT

ENTER = NO EXIT

SAVE
RETRY
ABORT
MORE
HELP

- Press **Esc** to return to the beginning of the protocol sequence.

- Press **Ent** to return to the start of this test-step.

Protocol Results

When you have completed all the test-steps and exercise-steps in a protocol, the protocol results show on the display:

Equiv FF = 179 PASS

Avg % leak = 0.560


VIEW
PRINT

- Press **F2** (**PRINT**) and the results are sent to the attached printer,

- Press **F1** (**VIEW**) and the display changes to the following:

TEST DATE: 10/20/98 06:20:34 PM


NEXT
PREVIOUS


- ☐ Press  (VIEW) and the first four steps in Protocol #1 appear.

*** VIEW OSHA PROTOCOL ***			
<u>Step</u>	<u>Type</u>	<u>Description</u>	<u>Duration</u>
1	Exer	Normal Breathing	60
2	Test	Face Forward	N/A
3	Exer	Deep Breathing	60
4	Test	Face Forward	N/A
ESC=Exit			↑ ↓ Scroll

NOTE:

Use the ↑ and the ↓ keys to scroll through the steps.

Press  once to return to the previous screen.


Press  twice to return to the Edit Protocol Menu, Building and Editing a Protocol.

Building and Editing a Protocol

Design your own protocol or change an existing protocol using the instructions below.

- ☐ From the MAIN MENU, select the EDIT PROTOCOL MENU; then press the ↓ key to select the desired protocol.

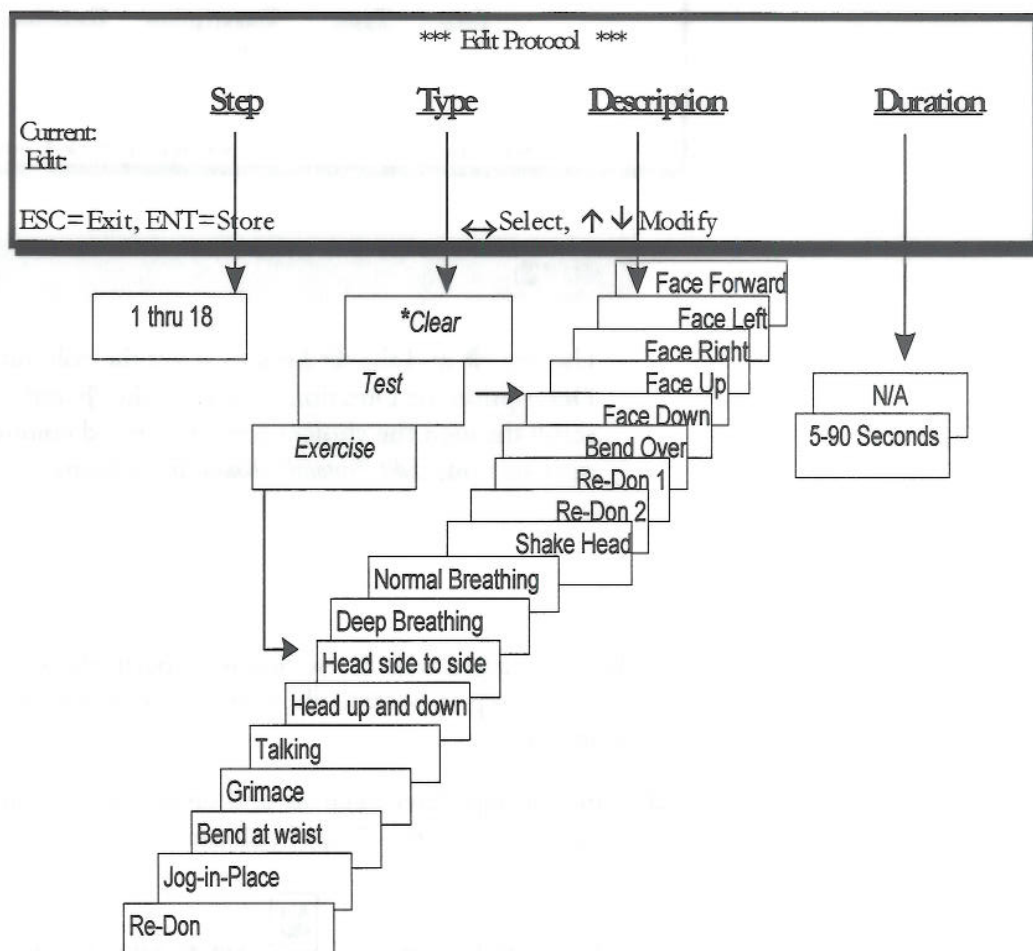
TEST	EDIT PROTOCOL	SYSTEM	UTILITY
	<div> OSHA Protocol REDON Protocol MIL Protocol SCRA Protocol </div>	<div> Custom 1 Protocol Custom 2 Protocol Parameters </div>	
Edit, Print, or View Protocol 1			

- ☐ Press  and the display changes to this:

*** EDIT CUSTOM 1 PROTOCOL ***			
EDIT	PRINT	VIEW	HELP

Edit-Protocol Choices

The diagram below lists all selections. All are available for each protocol step.



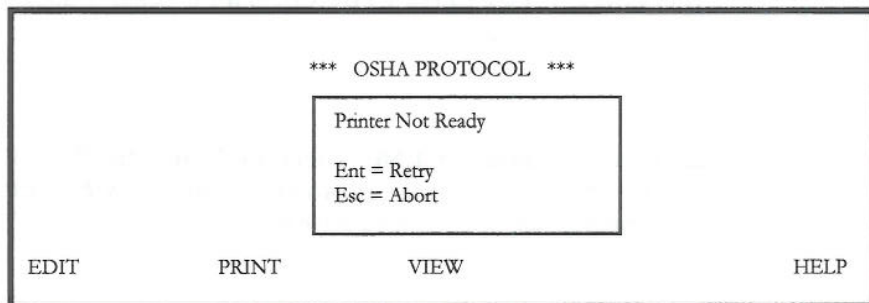
Select **Clear ONLY at the end of a protocol. When the **FitTester 3000** encounters a **Clear**, it does not advance to the next step. Instead it calculates results and shows a summary report. If all 18 steps are used, the additional step with **Clear** in the **Type** column is not necessary.*

NOTE:



Use the → and the ← keys to select the column: Step, Type, Description, or Duration. Then use the ↑ and the ↓ keys to scroll through the choices for the selected column. Refer to the next section, *Edit-Protocol Choices*, for a listing of the selections.


Printer Not Ready

If the printer does not begin printing, this message appears:



NOTE:

Press  to return to the previous display. Press  once to return to the previous screen.

The “Printer Not Ready” message is an indication that there is a problem with the cable or the printer. Check both the cable and the printer before attempting a “Retry.” Press  to retry.


Editing Parameters

The *FitTester 3000* stores parameter values in nonvolatile memory. Follow the instructions below to change a parameter value.


- First, select "Parameters" from the EDIT PROTOCOL MENU as indicated below:

TEST	EDIT PROTOCOL	SYSTEM	UTILITY
	OSHA Protocol REDON Protocol MIL Protocol SCBA Protocol	Custom 1 Protocol Custom 2 Protocol Parameters	




Edit, Print, or View Parameters

Next, press  and the display changes to this:

PARAMETERS			
EDIT	PRINT	VIEW	HELP

- Now press  (EDIT) and the display looks similar to this:

DEFAULT TEST PARAMETERS			
Mask Type	:	FULL FACE	
Male/Female	:	MALE	
HM Passing FF	:	100	
FF Passing FF	:	500	
SAVE	RECALL	↓ (-) ↑ (+)	HELP

- The "Mask Type" parameter is highlighted first. To select another parameter, press the ↓ or ↑ key.
- To change a parameter value, press the  ↓ (-) or  ↑ (+) function key.
- Press  (SAVE) to save the new value.

Default Parameter Values

(factory defaults in bold)

**Work Rate***

Light (100 Kcal/Hr)

Mod (200 Kcal/Hr)

Heavy (300 Kcal/Hr)

Extreme (350 Kcal/Hr)

Mask Type***HALF FACE**

FULL MASK

Subject***MALE**

FEMALE

HM Passing **

0 to 10,000 in increments of the most significant digit. The minimum passing fit factor is the minimum fit factor required for a passing result for a half mask... **(OSHA 100)**

FF Passing

0 to 10,000 in increments of the most significant digit. The minimum passing fit factor is the minimum fit factor required for a passing result to full face mask... **(OSHA 500)**

**Cartridge Type*****Low** (Dust/Mist Filter)**Medium** (Chemical or HEPA)**High** (Chemical and HEPA)**N/A** (SCBA, PAPR, etc.)


These parameters are not available in the EDIT Protocols in Parameters section. They may be changed in Custom 1 and Custom 2 Protocols using the "other" option.

***NOTE:**

Refer to *Pre-Test Parameters* for an explanation of these parameters and their associated values.

****NOTE:**



Refer to *Minimum Passing Fit Factor* for an explanation of this parameter. Changing this value affects the pre-test results.

□ Press  and the following display appears:

*** SET TIME AND DATE ***				
	<u>Time</u>	<u>Date</u>	<u>Day</u>	<u>Mode</u>
Current :	03:08:07 pm	7/14/98	Fri	12hr
Adjust :	<u>03:08:07 pm</u>	7/14/98	Fri	12hr

Esc = Exit, ENT = Store ⇔ Select , ↑ ↓
Modify

Use the ← or → keys to select the value on the “Adjust” line. Then use the ↑ and the ↓ keys to change the selected value.

□ Press  to store the time. Press  to return to the SYSTEM MENU.

To return to the SYSTEM MENU without storing the time, press  only.

System Reset

“System Reset” resets the protocols, parameters to the factory default values, and the piston to home position within the cylinder. In the event of a momentary power outage, it is recommended that the system be reset as explained below.

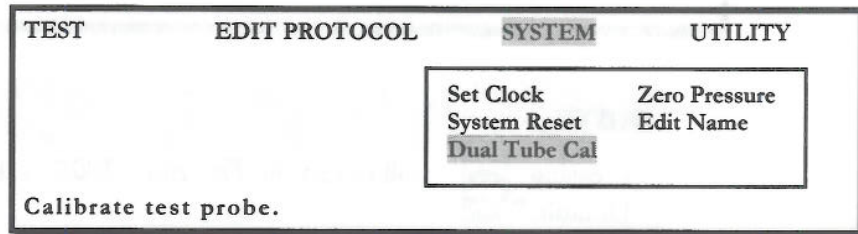
□ Select “System Reset” from the SYSTEM MENU as indicated below.



TEST	EDIT PROTOCOL	<u>SYSTEM</u>	UTILITY
		Set Clock <u>System Reset</u> Dual Tube Cal	Zero Pressure Edit Name
Edit, Print, or View Parameters			

□ Press  and the following warning will appear.:

Follow these steps to perform the dual tube calibration:

- ☐ Select "Dual Tube Cal" from the SYSTEM MENU as indicated below:



- ☐ Press  . Follow the instructions on the *FitTester 3000* display and connect the two female quick-disconnect adapters on the dual tube assembly to either of the male quick-disconnect adapters on the *FitTester 3000* front panel labeled "DUAL TUBE CHECK."
- ☐ Press  and the *FitTester 3000* begins with the engine pulling the piston away from home and then driving it home. This will aid in clearing any dirt or debris in the dual tube orifice. After completion of the clearing cycle, the dual tube assembly is calibrated at six flow rates. Results are shown on the display as the *FitTester 3000* calculates and plots them. If an ERROR MESSAGE appears see note and table on next page.

NOTE:

Listed on the next page are the error messages that may appear on the display and what action to take.

Zero Pressure

“Zero Pressure” removes the offset from the pressure transducer.

- ☐ First select “Zero Pressure” from the SYSTEM MENU as indicated below:

TEST	EDIT PROTOCOL	SYSTEM	UTILITY
		<div style="border: 1px solid black; padding: 5px;"> Set Clock System Reset Dual Tube Cal </div>	<div style="border: 1px solid black; padding: 5px;"> Zero Pressure Edit Name </div>
Remove offset from transducer.			

- ☐ Press  .

- ☐ Disconnect the dual tube assembly.

- ☐ Press any key and the offset from the pressure transducer is removed and SYSTEM MENU reappears

Error Message

If this procedure is unsuccessful, the following display appears:

```






*****
* Zero Offset is too large.                                *
* Ensure Dual Tubing is disconnected.                       *
* Testing inhibited.                                       *
* Run Transducer Zero again.                              *
* Press any key to continue.                              *
*****

```

There is an acceptable range of zero-offset values. Exceeding that range of values indicates that the dual tube assembly is connected, or that there is a problem in the pressure transducer or the conversion circuit. Fit-testing is inhibited at these times.

If the dual tube assembly is disconnected and the above-illustrated error message occurs, contact OHD to determine if the *FitTester 3000* needs service.

- ☐ Press any key to return to the SYSTEM MENU.

- ☐ Press  then press the  or the  key to select “Available” or “Not Available.”
- ☐ Press  again or press  to save your setting and return to the UTILITY MENU.

Diagnostic Routines

The seven diagnostic routines enable you to check your *FitTester 3000*.

- ☐ Select “Diagnostics” from the UTILITY MENU as indicated below.





TEST	EDIT PROTOCOL	SYSTEM	UTILITY
			<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Printer Diagnostics </div>
Run diagnostic utilities.			

- ☐ Press  .

INSTRUMENT DIAGNOSTICS	Version X.XX
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Speaker Test Keyboard Test Display Test Printer Test </div>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> View Cycle Count Factory Protocol Print Help file </div>
Test loudspeaker	

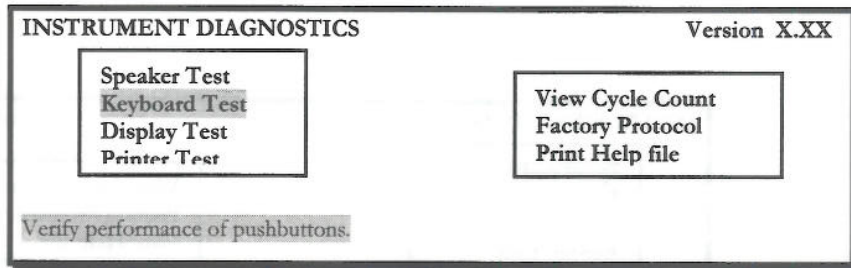
NOTE:


The current firmware version is shown in the upper right corner “Version X.XX.”

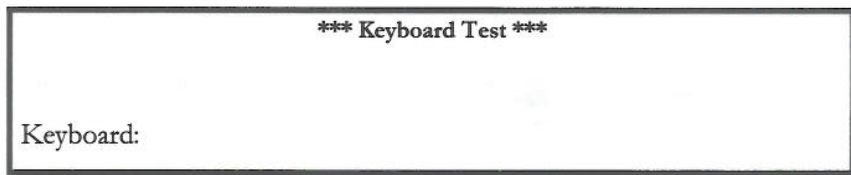
- ☐ Use the , , , or  key to select a diagnostic routine from the INSTRUMENT DIAGNOSTICS MENU.

Keyboard Test

- ☐ Press the  key to select "KEYBOARD TEST."




- ☐ Press  and the display shows:

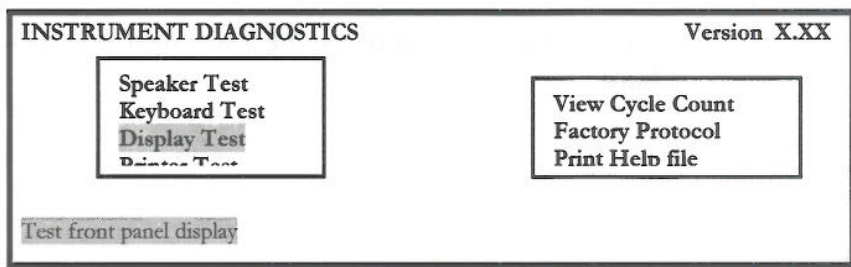



During this test, the keypad inputs are echoed to the display. When you press a key, the description of that key should show on the display.

When the  key is pressed, "Escape" shows on the display and then you are returned to the INSTRUMENT DIAGNOSTICS MENU.

Display Test

- ☐ Press the  key to select "DISPLAY TEST."



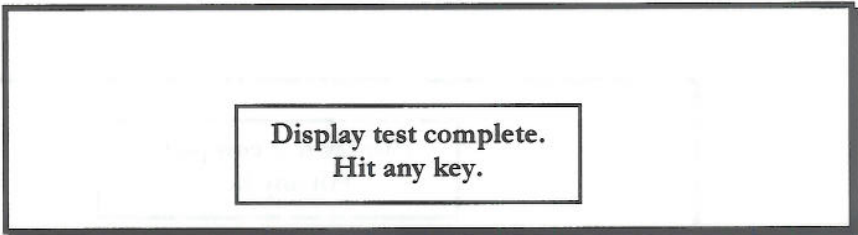
- ☐ Press  and the display shows:

- ❑ Press any key to return to the INSTRUMENT DIAGNOSTICS MENU.

A series of tests is performed in the order shown below:

- ◆ Text plane – Even column test
- ◆ Text plane – Odd column test
- ◆ Text plane – Even row test
- ◆ Text plane – Odd row test
- ◆ Text plane – Solid fill test
- ◆ Text plane – Character test
- ◆ Graphics plane – Even vertical test
- ◆ Graphics plane – Odd vertical test
- ◆ Graphics plane – Even row test
- ◆ Graphics plane – Odd row test
- ◆ Graphics plane – Solid fill test

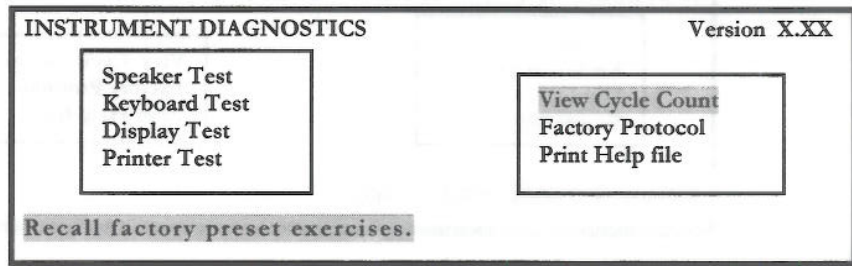
The following is the last message to show on the display in the “Long Test.”




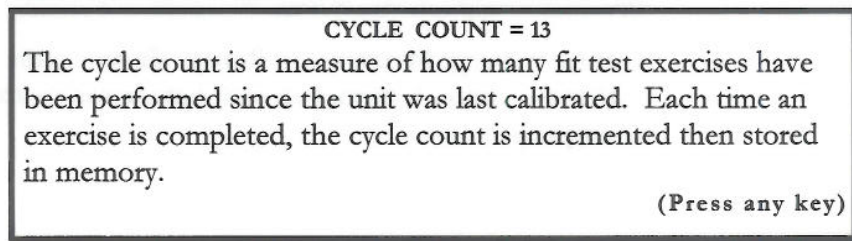
Display test complete.
Hit any key.

View Cycle Count

- ☐ Select "VIEW CYCLE COUNT" from the INSTRUMENT DIAGNOSTICS MENU.



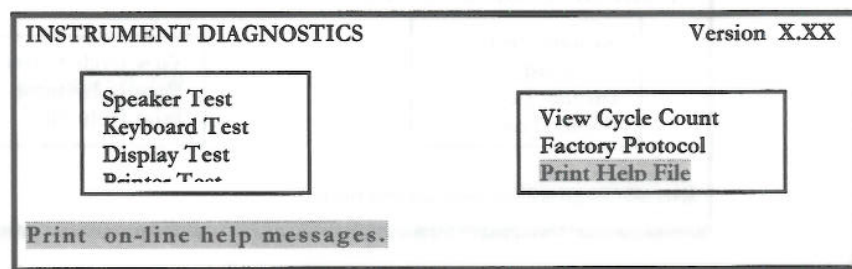
- ☐ Press . The *FitTester 3000* displays the cycle count and an explanation of the cycle count.



- ☐ Press any key to return to the INSTRUMENT DIAGNOSTICS MENU.

Print Help File

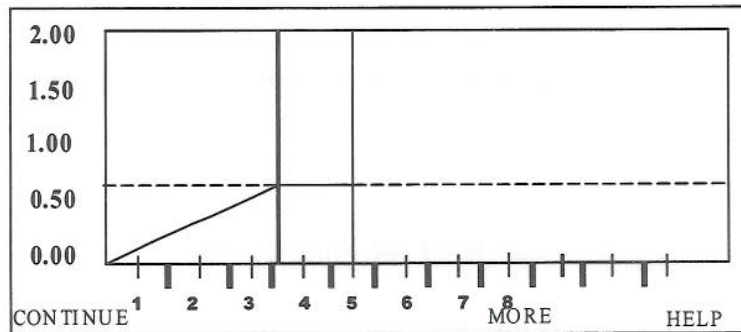
- ☐ Select "PRINT HELP FILE" from the INSTRUMENT DIAGNOSTICS MENU.



- ☐ Press . The *FitTester 3000* outputs the Help File to the printer.

Large Leak

At other times the *FitTester 3000* will labor to create the negative pressure only to end the test measurement before the 8-second time. This leakage, although less than maximum, still fills the cylinder and abruptly ends the test. It will look something like this:

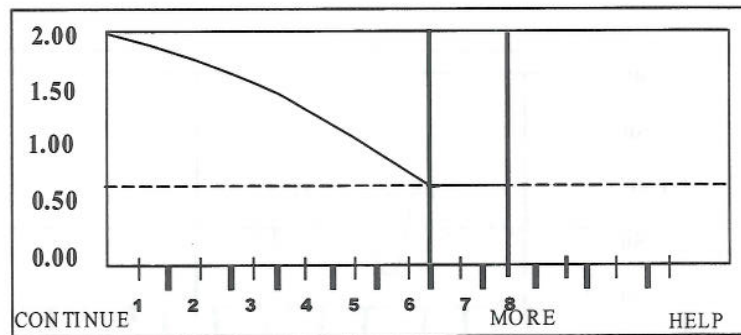


Possible Solutions

1. Check all connections for proper attachment.
2. Check to ensure that the *FitTester 3000* mask adapter is properly attached to the respirator. Look for cross-threading, loose connection, etc.
3. Make sure that the squeeze bulb was held securely closed throughout test time.
4. Check mask for proper tightness to the face and check that no hair, beard stubble, or other objects inhibit a good face-to-facepiece seal.
5. TRY A DIFFERENT MASK! Many masks SEEM to fit well but are NOT properly sized to a specific wearer. In other cases a different style may be better suited for the individual wearer.

Over-breathing

If the pump motor does not seem to activate until after the challenge pressure is established or if the mask pressure line doesn't come down to the challenge pressure line, the negative pressure in the mask is greater than normal at the start of the test. A typical graph would look like this:



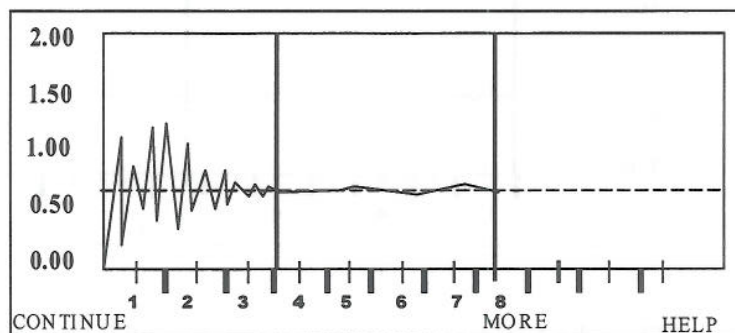
When the subject being tested continues to inhale after the squeeze bulb valve has been closed, it creates a negative pressure in the mask greater than needed for the test.

Possible Solutions

1. Re-instruct the subject, if he is operating the squeeze bulb, as to when to squeeze the bulb (after inhaling).
2. Operator should hesitate squeezing the bulb for $\frac{1}{2}$ or 1 second after the subject inhales.

Rapid or Erratic Graph Movement (Before or During Test)

When the *FitTester 3000* gives erratic, jerky movement during the test, especially before the challenge pressure is attained, and the challenge pressure takes awhile to attain, the problem might be an easy one to find and solve. The graph might look something like this:



When the inhalation valve is not propped open or removed, the *FitTester 3000* is unable to get to the airspace touching the facepiece seal. The *FitTester 3000* is only looking at the seal of the inhalation valve, which can rapidly “flutter” with the sealing and breaking of the seal. The inhalation valve can easily be missed on some full-facepiece respirators that can be converted from SCBA or airline to Air Purifying Respiratory.

Possible Solution

Insure that the *Inhalation Valve* is propped open or removed.

SQUEEZE BULB

Symptom:

The squeeze bulb takes a few seconds to inflate or does not inflate immediately after release. Fit factors are low for all types of respirators.

Possible Problem:

Pinhole leak in the mask adapter diaphragm or problem with squeeze bulb.

Possible Solutions

1. Replace the diaphragm (located under the aluminum plate with 8 locking screws on the valve adapter).
2. Replace squeeze bulb.

