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

| Revision History | | |
|---|---|---|
| Revision | Description | Date |
| C | Firmware Version 4.10 | 1/96 |
| D | New format | 12/97 |

## Copyright



## Standard Terms and Conditions

### Refunds & Credits

Please note that only serialized products (products labeled with a distinct serial number) and accessories are eligible for partial refund and/or credit. Nonserialized parts and accessory items (cables, carrying cases, auxiliary modules, etc.) are not eligible for return or refund. In order to receive a partial refund/credit of a product purchase price on a serialized product, the product must not have been damaged by the customer or by the common carrier chosen by the customer to return the goods, and the product must be returned complete (meaning all manuals, cables, accessories, etc.) within 90 days of original purchase and in "as new" and resellable condition. The *Return Procedure* must be followed to assure prompt refund/credit.

### Restocking Charges

Only products returned within 90 days from the date of original purchase are eligible for refund/credit. Products returned within 30 days of original purchase are subject to a minimum restocking fee of 15%. Products returned in excess of 30 days after purchase, but prior to 90 days, are subject to a minimum restocking fee of 20%. Additional charges for damage and/or missing parts and accessories will be applied to all returns. Products not returned within 90 days of purchase, or products which are not in "as new" and resellable condition, are not eligible for credit return and will be returned t the customer.

### Return Procedure

Every product returned for refund/credit must be accompanied by a Return Material Authorization (RMA) number, to be obtained from our Order Processing Department. All items being returned must be sent freight prepaid to our factory location.

## Certification

This instrument was thoroughly tested and inspected and found to meet DNI Nevada's manufacturing specifications when it was shipped from the factory. Calibration measurements are traceable to the National Institute of Standards and Technology (NIST). Devices for which there are no NIST calibration standards are measured against in-house performance standards using accepted test procedures.

## Warranty

### Warranty and Product Support

This instrument is warranted by DNI Nevada against defects in materials and workmanship for one full year from the date of original purchase. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you return the product, shipping prepaid, to DNI Nevada, Inc. This warranty does not apply if the product has been damaged by accident or misuse or as the result of service or modification by other than DNI Nevada. IN NO EVENT SHALL DNI NEVADA BE LIABLE FOR CONSEQUENTIAL DAMAGES.

Only serialized products and their accessory items (those items bearing a distinct serial number tag) are covered under this one–year warranty. PHYSICAL DAMAGE CAUSED BY MISUSE OR PHYSICAL ABUSE IS NOT COVERED UNDER THE WARRANTY. Items such as cables and nonserialized modules are not covered under this warranty.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state, province to province, or country to country. This warranty is limited to repairing the instrument to DNI Nevada's specifications.

When you return an instrument to DNI Nevada, Inc., 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. DNI Nevada 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 semiannual calibration frequency, is not covered under the warranty.

### Warranty Disclaimer

Should you elect to have your instrument serviced and/or calibrated by someone other than DNI Nevada, 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 DNI Nevada 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 DNI Nevada's technical support department at 702-883-3400. 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. DNI Nevada will not be responsible for any injuries sustained due to unauthorized equipment modifications.

# Chapter 3 Operating Instructions

# Abbreviations

NOTE: This column is alphabetized.

| | |
|---|---|
| **ANSI** | American National Standards Institute |
| **A** | ampere |
| **C** | cartridge |
| **Clr** | clear |
| **cc/min** | cubic centimeters per minute |
| **EEROM** | electrically erasable read–only memory |
| **Exer** | exercise |
| **FF** | fit factor or full face |
| **HM** | half mask |
| **HI** | high |
| **HEPA** | High Efficiency Particulate Arresting |
| **"$H_20$** | inches of $H_20$ |
| **kcal/hr** | kilocalories (kilogram–calorie) per hour |
| **LCD** | liquid crystal display |
| **L/min** | liters per minute |
| **LPM** | liters per minute |
| **MSK** | mask |
| **Med** | medium |
| **N/A** | not applicable |
| **OSHA** | Occupational Safety and Health Agency |
| **PAPR** | Powered Air Purifying Respirator |
| **s** | second |
| **SCBA** | Self–Contained Breathing Apparatus |
| **Test–Q** | test quality |
| **WR** | work rate |

*This page intentionally blank.*

**FitTester 3000 follows...**

... a set procedure—a protocol. Each protocol consists of 1 to 18 steps (a step is either a fit test or an exercise), and a set of operator–specified parameters. The parameters are respirator mask data (cartridge type and respirator type), personal data (gender and work rate), and minimum passing fit factor. Protocol usage helps achieve accurate overall fit–test results.

NOTE 1: Refer to *PROTOCOLS, TEST AND PROTOCOL RESULTS,* and *PARAMETERS* in *Chapter 3 - Operating Instructions.*

NOTE 2: Some regulatory agencies require a defined procedure or protocol.

## Features

If you don't have a quantitative fit–testing program, the FitTester 3000 helps you start one. Or, if you have a quantitative fit–testing program, the FitTester 3000 is easy and effortless to integrate into your present program.

These features make the FitTester 3000 simple to use:

- Doesn't need a computer.
- Eliminates the cumbersome booth, generator, and photometry equipment required for aerosol testing.
- Doesn't require an invasive probe.
- Doesn't use messy challenge agents or alcohol.
- Compared to other quantitative fit–test systems, test time is dramatically reduced.
- Directly measures leakage flow—the primary measure of respirator fit.
- Tests workers in their personal respirator—the actual respirator mask worn in the workplace.
- The industry's first self–calibrating fit tester.
- The quantitative fit–test results include Fit Factor, Leak Rate, Test Time, Test–Q (Test Quality), Challenge Pressure, Modeled Breathing Rate, and Minimum Passing Fit Factor.
- The protocol results include Average Percent Leak, Equivalent Fit Factor, Q (Protocol Quality), Test Date, Test Time, Test Parameter Values, and a step–by–step summary of the protocol.
- Supports OSHA fit–testing protocol requirements.
- Up to five custom protocols can be created and stored in nonvolatile memory.
- Menu–selectable commands.
- A comprehensive "Help" program is available at the touch of a button.
- Test results may be output to the display, an external printer, or a database*.
  *NOTE: FitTrak software must be installed.
- Return air bypass valve. Air extracted from the mask is exhausted out the "EXHAUST" port, located on the back of the instrument.

## RS–232 SERIAL PORT SETUP

The FitTester 3000 has a remote control mode. The FitTrak software operates the FitTester 3000 via the RS–232 serial port. Dynatech Nevada recommends that you use the appropriate cable. Information about available cables is located in Chapter 1, *STANDARD ACCESSORIES*.

Connect the RS–232 cable (DNI Part # 3010-0250) between the FitTester 3000 and the computer.

NOTE: If the computer's COMM port is a 9–pin connector, connect both RS–232 cables (DNI Part # 3010-0250 and DNI Part # 3010-0261) together; then connect them between the FitTester 3000 and the computer.

## FRONT PANEL CONTROLS

**Keyboard**

| | |
|---|---|
| <Esc> | Escape: Exits a menu routine and returns to the next highest level menu routine. |
| <F1>, <F2>, <F3>, <F4>, and <F5> | Function keys: Executes function displayed above key when pressed. |
| <Ent> | Enter: Starts a menu routine or function. |
| <↑>, <→>, <↓>, and <←> | Arrow keys: Moves highlight bar through selections. |

**Five quick–disconnect adapters**

| | |
|---|---|
| "FLOW" | Female quick–disconnect adapter on the front panel that connects to the dual tube assembly. See the first section of the next chapter, *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 the first section of the next chapter, *PREPARING THE FITTESTER 3000 FOR TESTING (4. DUAL TUBE ASSEMBLY CONNECTION)*. |
| "EXHAUST" | Male quick–disconnect adapter on the rear panel. |
| "DUAL TUBE CHECK" | Two male quick–disconnect adapters on the front panel. See the *SYSTEM MENU, Dual Tube Calibration* section in the next chapter. |

**Two knobs**

| | |
|---|---|
| "VOLUME" | Rotate this knob to increase and decrease the volume. |
| "VIEW" | Rotate this knob to change the viewing angle. |

# Chapter 3

# Operating Instructions

## MECHANICAL INTERFACES

The test adapters provide mechanical connections between respirator masks and the squeeze–bulb assembly and/or the dual tube assembly. Three types of test adapters are used:

- Type "A" Provides a mechanical connection to the squeeze–bulb assembly.*
- Type "B" Provides a mechanical connection to the dual tube assembly.*
- Type "AB" Provides a mechanical connection to the squeeze–bulb assembly and the dual tube assembly.**

*NOTE: For respirator masks with two filter cartridges, use one each of the type "A" test adapter and the type "B" test adapter.

**NOTE: For respirator masks with a single filter cartridge, use the type "AB" test adapter.

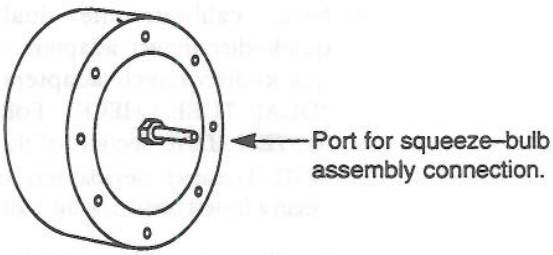
### Type "A" Test Adapter

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

A test subject holds his or her breath and closes the valve by squeezing the bulb. In 8 seconds or less, when the test finishes, the test subject releases the squeeze bulb placing the valve in its normally open position, which creates a breathing path for him or her.

*Test–Adapter–Valve Operation*

1. Connect the squeeze–bulb assembly to the port on the test adapter.
2. Close the valve by squeezing the bulb.
   NOTE: Ensure that a constant force is maintained on the squeeze–bulb assembly when the valve is closed. Have the test subject operate the squeeze–bulb assembly during the fit test.
3. Open the valve by releasing grip on the bulb; this enables the air to flow.




*Type "A" Test Adapter*

# QUANTITATIVE FIT TEST OVERVIEW

## Quantitative Fit Test Procedure

The FitTester 3000 does not require an invasive probe in the respirator mask. In most cases, the test subject can be tested using the actual respirator mask that is worn in the workplace.

The respirator mask inlets are capped with one or two of the test adapters described in the previous section and inhalation valves are removed. The test subject dons the respirator mask to perform the fit test. When the mask is properly positioned, the test subject takes a deep breath, holds his or her breath, and squeezes the bulb to close the adapter valve. The operator presses the start key to begin the fit test and that starts the piston moving within the cylinder (inside the FitTester 3000). The piston movement within the cylinder removes air from the facepiece until a predetermined challenge pressure is reached (see *Challenge Pressure* in the *PRETEST* section). The fit test finishes in 8 seconds or less.

The FitTester 3000 controls the piston movement to maintain the challenge pressure inside the facepiece. The piston speed required to maintain a constant pressure is directly related to the air flow. Since leakage is directly related to respirator–mask–fit, the lower the leakage, the better the fit. The leak rate is reported in cubic centimeters per minute.

## Protocol

One quantitative fit test consists of the 8–second–or–less procedure explained above. A series of quantitative fit tests and exercises is the protocol.

The protocol is a procedure that is followed by a company or institution as a part of its respiratory protection program. A protocol can be a series of fit tests or exercises, or a combination of fit tests and exercises.

You can tailor the protocol to meet your company's needs or use the factory preset values. This is a comprehensive test that determines accurately and completely the fit of a given respirator mask. Consistent fit–test results are achieved by using a protocol.

## Fit Factor

The ratio of the modeled breathing rate to the measured leak rate is the calculated fit factor, which is abbreviated FF: therefore, *FF (fit factor) = modeled breathing rate ÷ measured leak rate.*

The *modeled breathing rate* is the rate, in liters per minute, at which an individual breathes, and is calculated from the parameters specified by the operator for each protocol or fit test. The operator–specified parameters are inspiratory work rate, respirator mask type, cartridge type, and test subject's gender.

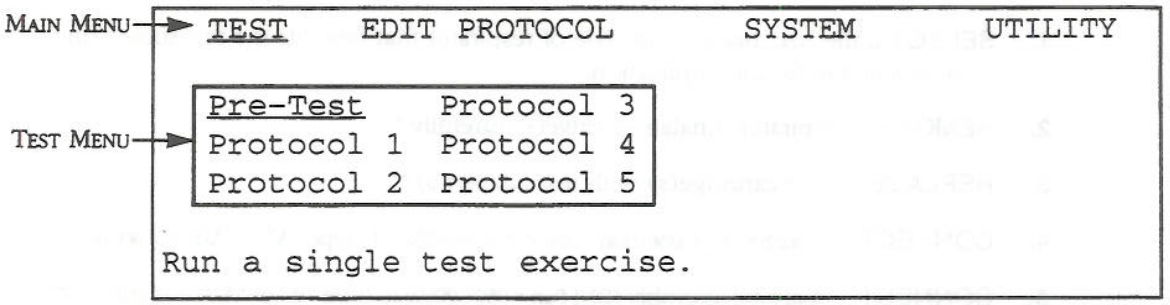
The *measured leak rate* is directly related to facepiece fit. It is from the leak rate measurement that all fit factor calculations are made. The leak rate is specified in cubic centimeters per minute (cc/min).

NOTE: The FitTester 3000's fit factor is equivalent, by definition, to fit factors obtained by traditional quantitative fit test methods (that is, aerosol methods). However, the FitTester 3000's leak measurement doesn't use aerosols; therefore, it doesn't have the mixing problems associated with quantitative aerosol measurement methods.

The FitTester 3000's direct leakage measurement is superior to the aerosol approximation methods because the leakage measurement isn't dependent on aerosol particle–size distribution.

## Power–On and MENU Navigation

The power–on/off switch is located on the rear panel of the FitTester 3000. When you turn on the instrument, the current firmware version, followed by the MAIN MENU and the TEST MENU appear as shown below:



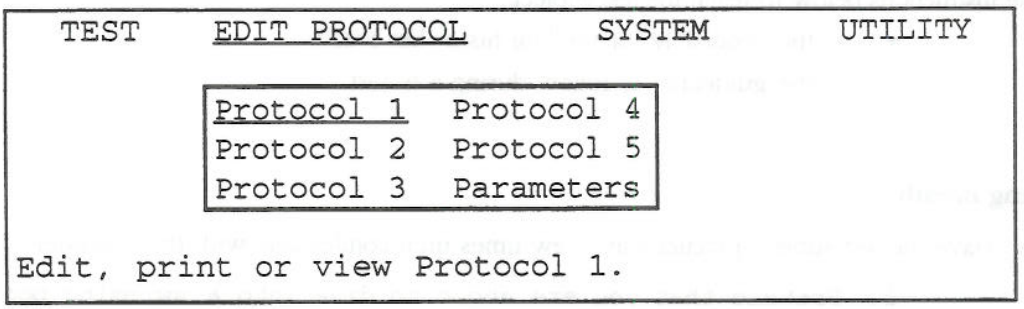

NOTE 1: The "Pre–Test" menu routine on the TEST MENU is active first.

NOTE 2: Use the <↑> or <↓> key to select "Pre–Test" or a protocol from the TEST MENU; then press the <Ent> key to continue.

NOTE 3: To run a pretest, refer to the *PRETEST* section. To run a protocol, refer to the *PROTOCOLS* section.

### Use the <→> or <←> Key to Change MENUS

1. Press the <→> key and the display shows the MAIN MENU and the EDIT PROTOCOL MENU:



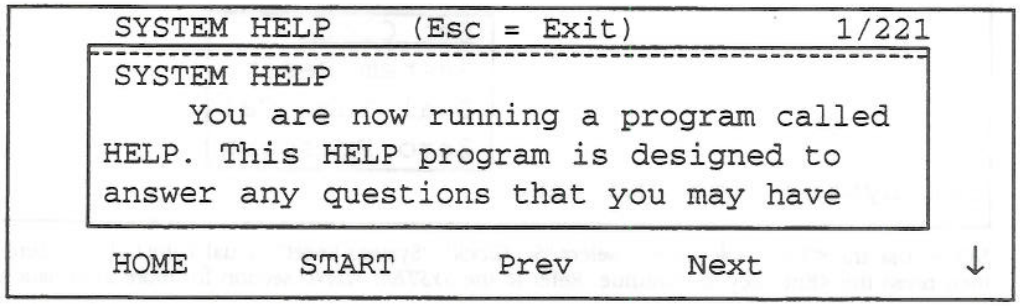

NOTE 1: Use the <↑> or <↓> key to select a protocol or "Parameters"; then press the <Ent> key to continue.

NOTE 2: To view, build, edit, or print a protocol, refer to the *PROTOCOLS* section. To view, edit, or print a parameter, refer to the *PARAMETERS* section.

*continued on the next page*

## Help Program

The "HELP" program provides detailed information about each of the menu routines.




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

NOTE 1: The numbers in the upper right corner of the display indicate the current line number (left of the slash mark) and the total number of lines in the "HELP" program (right of the slash mark).

NOTE 2: The ↓ in the lower right corner of the display indicates that additional lines follow.

NOTE 3: Using the "HELP" program is similar to opening a book to a specific page.

### Press <F5> to Activate "HELP"

Activate "HELP" by pressing <F5> when any one of the menu routines is active. Instructions pertaining to the currently running menu routine then appear on the display. Scroll through the "HELP" program (line by line) using the <↑> or the <↓> key.

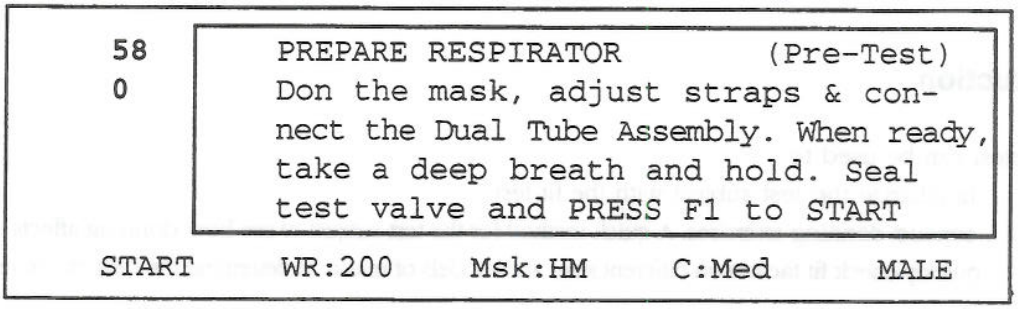
NOTE: The "HELP" program always goes to the top of the section for the active menu routine.

### Function Key Operation

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

| | | | |
|---|---|---|---|
| • | <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> | *Inactive* | Inactive key. |
| • | <Esc> | Escape | Returns to the active menu routine. |
| • | <↑> | up arrow | Moves up one line. |
| • | <↓> | down arrow | Moves down one line. |
| • | <←> | *Inactive* | Inactive key. |
| • | <→> | *Inactive* | Inactive key. |

**3.** Press any key to continue and the display looks like this:




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

The challenge pressure (in this illustration **58**) is located immediately above the respirator mask pressure (in this illustration **0**). See below for details about these pressures and the parameters (keys <F2>–<F5>).

NOTE: Ensure that the respirator mask pressure is zero before running the pretest. If the respirator mask pressure is not zero, follow the *Zero Pressure* instructions in the *SYSTEM MENU* section of this chapter.

**Challenge Pressure**

The FitTester 3000 calculates the negative pressure that would be produced in the respirator mask during inhalation. This pressure is called the challenge pressure. The parameters of work rate, respirator mask type, cartridge type, and test subject's gender are used to calculate the challenge pressure.

The challenge pressure is equal to the pressure produced in the respirator mask during an inhalation, and shows (in hundredths of an inch of water) in the upper left portion of the display during the pretest.

NOTE: The challenge pressure is the pressure at which the leak rate measurement is made.

**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.

**Pretest 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.

*continued on the next page*

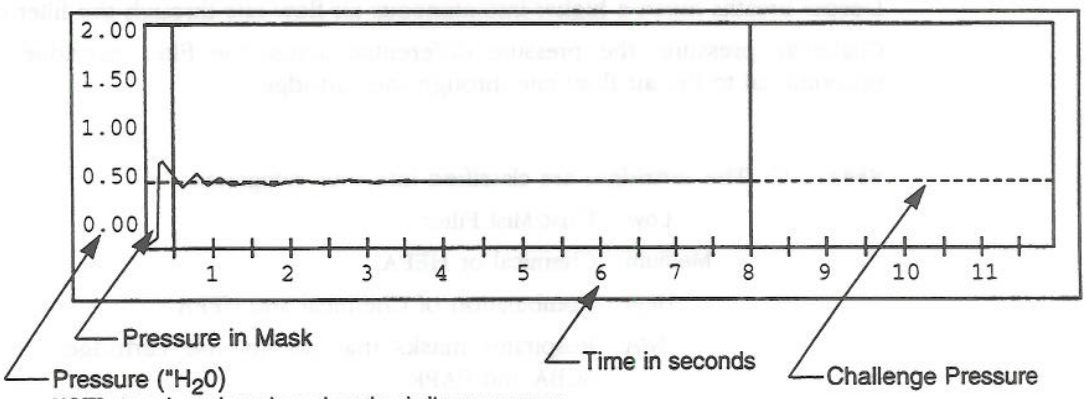
## Running the Pretest

This section instructs you on how to run a pretest.

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* in the *SYSTEM MENU* section of this chapter for more information.

1. Set parameter values as explained in the previous section *PRETEST, Pretest Parameters.*
2. 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 pretest results. Refer to the *Pretest Results* section.
3. Review the *Holding Breath* procedure, in *GETTING STARTED,* with the test subject.
4. Complete steps 1–4 in *PREPARING THE FITTESTER 3000 FOR TESTING.*
5. Complete steps 1–5 in *GETTING STARTED, Preparing the Respirator for Fit–Testing.*
6. Have the test subject don the mask and adjust the straps to achieve a good fit.
7. Make sure the test subject is seated comfortably with shoulders facing the FITTESTER 3000.
8. When the test subject is ready, have him or her take a deep breath and squeeze the bulb assembly.
   NOTE 1: Remind the test subject to remain as still as possible during the test.
   NOTE 2: Have the test subject maintain a constant force on the squeeze bulb.
9. Press the <F1>-START key to begin the pretest.
10. There are two beeps. On the second beep have the test subject release the squeeze bulb and instruct him or her to breath normally and relax.

During the pretest, a pressure trace appears as shown below:




NOTE: Actual numbers depend on the challenge pressure.

The FitTester 3000 measures respirator mask leakage after the pressure in the mask stabilizes at the challenge pressure (about 7 seconds).

The two beeps signify the following:

- The first beep (visually indicated by the first vertical line) signifies that the challenge pressure has been reached.
- The second beep (visually indicated by the second vertical line) signifies the end of the test.

**Fit Factor**

The first test result is the calculated fit factor, the ratio of the modeled breathing rate to the measured leak rate, abbreviated FF.

*FF (fit factor) = modeled breathing rate ÷ measured leak rate*

NOTE: The FitTester 3000's fit factor is equivalent, by definition, to fit factors obtained by traditional quantitative fit test methods (that is, aerosol methods). However, the FitTester 3000's leak measurement doesn't use aerosols; therefore, it doesn't have the mixing problems associated with quantitative aerosol measurement methods.

The FitTester 3000's direct leakage measurement is superior to the aerosol approximation methods because the leakage measurement isn't dependent on aerosol particle–size distribution.

Notice the word "PASS" or "FAIL" next to the fit factor:

- "FAIL" indicates that the calculated fit factor is less than the *Minimum Passing Fit Factor* (explained below).
- "PASS" indicates that the calculated fit factor is equal to or greater than the *Minimum Passing Fit Factor* (explained below).

**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 4% of the target challenge pressure. Large pressure spikes any time 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 *PRETEST, 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. The modeled breathing rate is influenced 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.

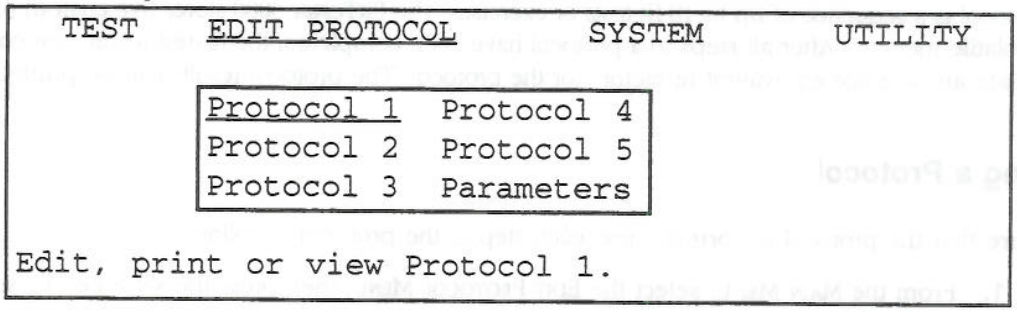
**Minimum Passing Fit Factor**

The minimum passing fit factor is the minimum fit factor required for a passing result. This is operator–specified as explained in the *PARAMETERS, Editing Parameters* section and displayed here. The PASS/FAIL indication that appears next to the fit factor is based on this number.

## Building and Editing a Protocol

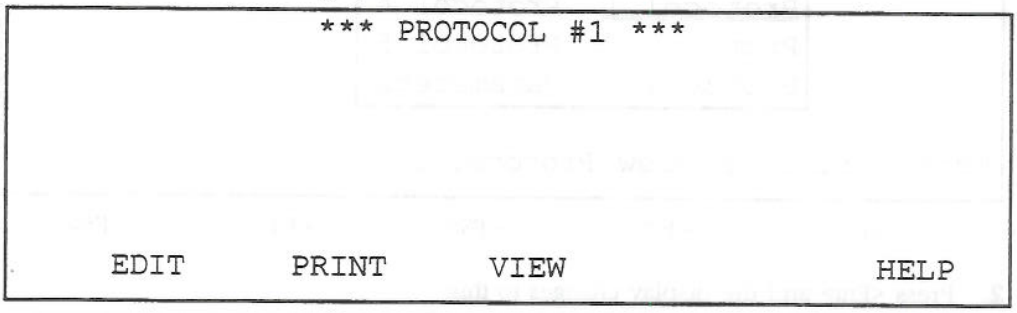
Design your own protocol or change an existing protocol using the instructions below.

1. From the MAIN MENU, select the EDIT PROTOCOL MENU; then press the <↓> key to select the desired protocol.



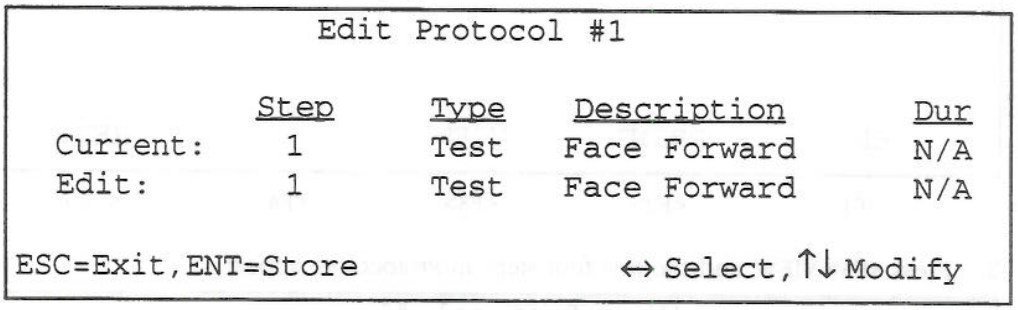

<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

2. Press <Ent> and the display changes to this:




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

3. Press <F1>-EDIT and the display looks similar to this:




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

NOTE: Use the <→> and the <←> keys to select the column: "Step", "Type", "Description", or "Dur". 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 choices.

When you are satisfied with the setting for a particular step, press the <Ent> key to save the step in nonvolatile memory. Select the next step and repeat the editing process.

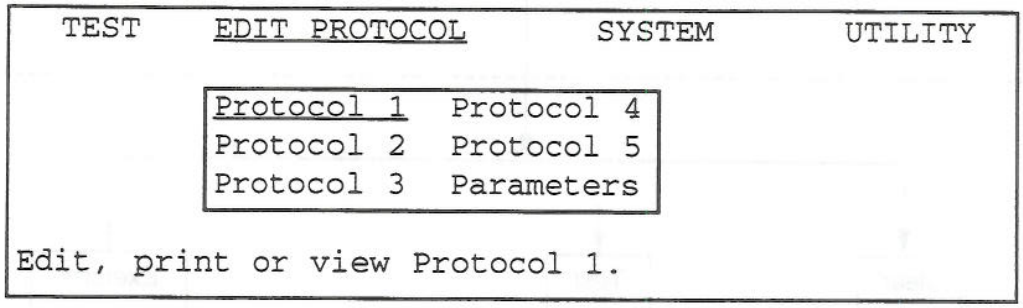
After all steps have been set and saved, enter an additional step and choose "Clr" in the "Type" column. Make sure to press the <Ent> key to save this step. This additional step, with "Clr" in the "Type" column, is necessary because it signals the end of a protocol sequence.*

*EXCEPTION: If all 18 steps are used, the additional step with "Clr" in the "Type" column is not necessary.

## Printing a Protocol

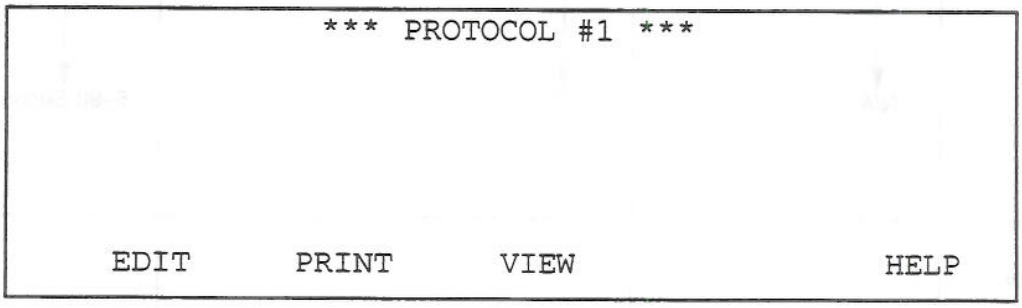
Ensure that a printer is connected and that the FitTester 3000 printer port is turned on as explained in *PREPARING THE FITTESTER 3000 FOR TESTING (2. PRINTER CONNECTION)* at the beginning of this chapter. Next, follow the instructions below to print a protocol.

1. From the MAIN MENU, select the EDIT PROTOCOL MENU; then press the <↓> key to select the protocol to print.
   NOTE: The FitTester 3000 prints a complete listing of the selected protocol.




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

2. Press <Ent> and the display changes to this:

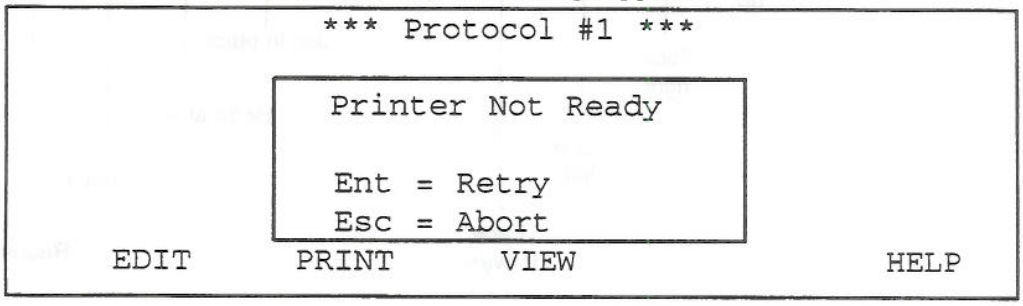



<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

3. Finally, press <F2>-PRINT and the printer begins printing.

**Printer Not Ready**

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

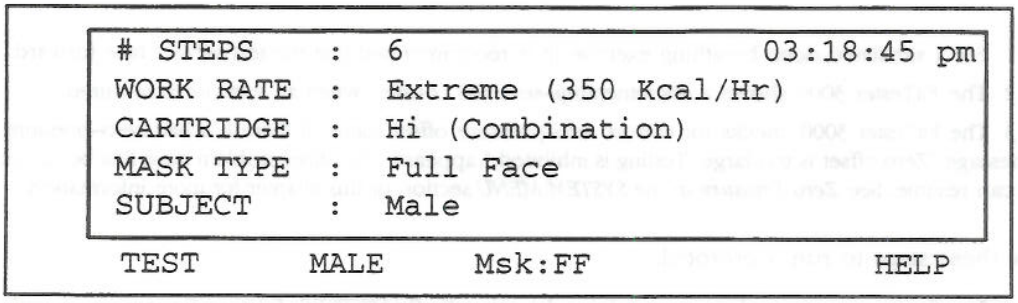



<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

NOTE: Press <Esc> to return to the previous display. Press <Esc> twice to return to the EDIT PROTOCOL MENU.

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 <Ent> to retry.

**9.** Press any key to continue. The display looks similar to this:



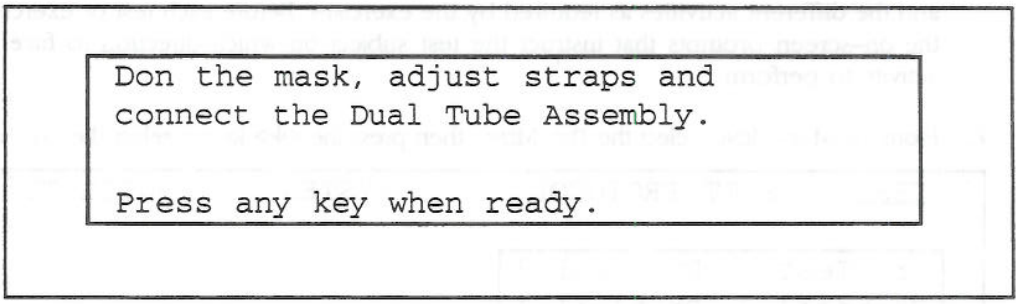

**10.** Even though you have set parameter values (in step 1), this step provides the opportunity to make some additional changes:

a) Press <F2> to identify the gender of the test subject—"Male" or "Female".

b) Press <F3> to select the respirator mask type—"HM" (Half Mask), or "FF" (Full Face).

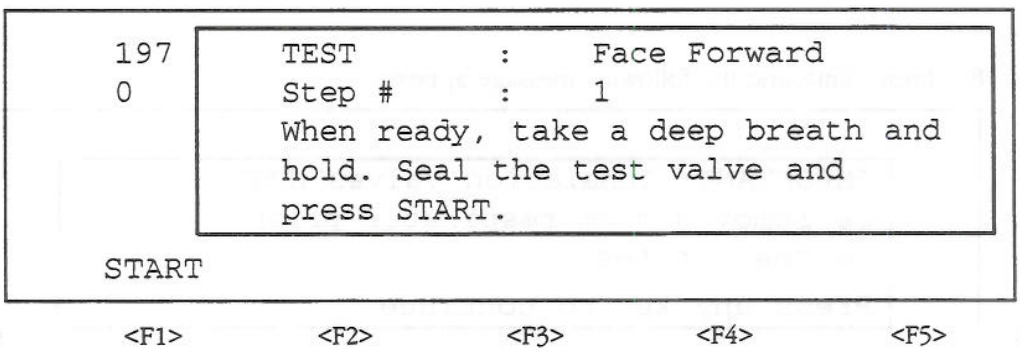
NOTE: Press <F5> to access the "HELP" program for the protocol. Refer to *GETTING STARTED, Help Program* for details about its operation.

**11.** Press <F1>-TEST and the display shows:




**12.** Have the test subject don the mask. Press any key to continue, and instructions as to which exercise to perform or which test position to assume appear on the display.

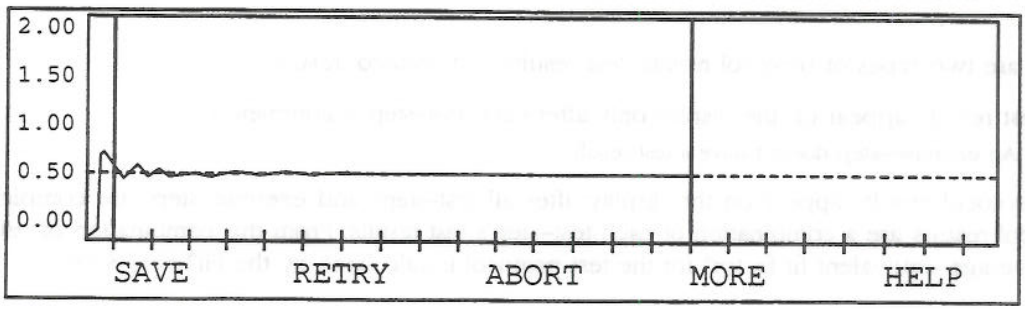
NOTE: For tests, it is recommended that the test subject control the test adapter valve and, when ready, squeeze the bulb to close the valve.




**13.** Press <F1>-START to start the test or exercise.

NOTE: After completion of each fit test you will be prompted to save, retry, or abort the fit test. See the next section, *TEST AND PROTOCOL RESULTS, Test Results*, for an explanation of these options.

**3.** Press <F4>-MORE again and the pressure trace from the fit test is shown again:

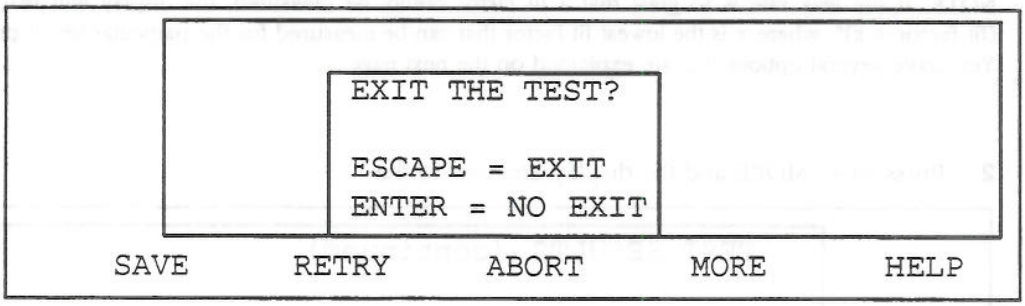



<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

**4.** Repeatedly press <F4> to scroll through the above displays.
NOTE: "TEST RESULTS" are explained in a previous section *PRETEST, Pretest Results.*

**You now have the following options:**

- Press <F1> to save this test–step's test results. The FitTester 3000 automatically advances to the next protocol step.
- To retry this test–step, press <F2>-RETRY.
- When you press <F3>-ABORT, the display shows the following:

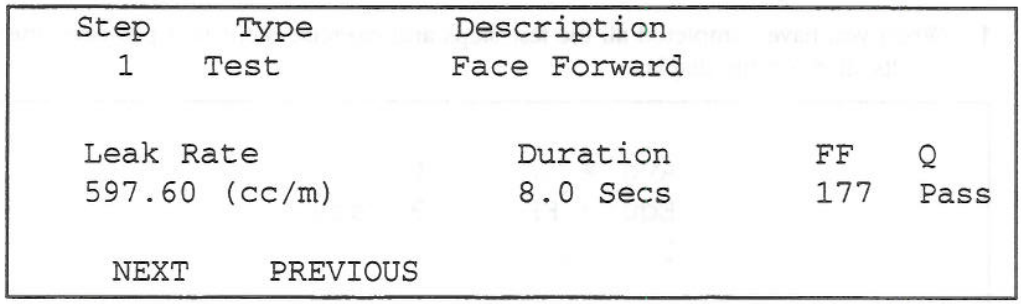



<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

a) Press <Esc> to return to the beginning of the protocol sequence.

b) Press <Ent> to return to the start of this test–step.

4. Press <F1>-NEXT to view a step–by–step summary of the protocol and a summary of each step's test results.




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

- Repeatedly press <F1>-NEXT to show each next step in the protocol.
- Repeatedly press <F2>-PREVIOUS to show each previous step in the protocol.

5. Press <Esc> several times to return to the MAIN MENU.

4. The "Work Rate" parameter is highlighted first. To select another parameter, press the <↓> or <↑> key.

5. To change a parameter value, press the <F3>- ↓(–) or <F4>- ↑(+) function key.

6. Press <F1>–SAVE to save the new value.

7. Press <F2>–RECALL to retrieve the previously saved value.

**Default Parameter Values**

- Work Rate* — Light (100 Kcal/Hr)
  Mod (200 Kcal/Hr)
  Heavy (300 Kcal/Hr)
  Extreme (350 Kcal/Hr)

- Mask Type* — FULL FACE
  HALF MASK

- Subject* — MALE
  FEMALE

- Min Passing FF** — 0 to 10000, in increments of the most significant digit.
  The minimum passing fit factor is the minimum fit factor required for a passing result.

- Cartridge Type* — Low (Dust Filter)—Dust/Mist Filter
  Med (Chem/HEPA)—Chemical or HEPA
  Hi (Combination)—Chemical and HEPA
  N/A (SCBA, etc.)—SCBA, PAPR, etc.

*NOTE: Refer to *PRETEST, Introduction, Pretest Parameters* for an explanation of these parameters and their associated values.

**NOTE: Refer to *PRETEST, Pretest Results, Minimum Passing Fit Factor* for an explanation of this parameter. Changing this value affects the pretest results.

# SYSTEM MENU

## Introduction

This section contains instructions on how to use the SYSTEM MENU to make adjustments to the system–level parameters:

- Set the clock.
- Reset protocols and parameters to the factory default values, and reset the piston in the cylinder to home position.
- Calibrate the dual tube assembly.
- Zero the pressure transducer.

### Set Clock

"Set Clock" allows the you to adjust the time and date of the battery–backed clock. All printed reports made by the FitTester 3000 include a time and date stamp; therefore, it is important to adjust the battery–operated clock to the current time and date.

1. Select "Set Clock" from the SYSTEM MENU as indicated in the following illustration:

```
  TEST    EDIT PROTOCOL       SYSTEM       UTILITY

                              Set Clock
                              System Reset
                              Dual Tube Cal
                              Zero Pressure

Set system time and date.
```

<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

2. Press <Ent> and the following display appears:

```
                ***Set Time and Date***

                    Time        Date     Day   Mode
Current :       03:08:07pm    7/14/95    Fri   12hr
Adjust  :       03:08:07pm    7/14/95    Fri   12hr

ESC=Exit,ENT=Store          ↔ Select,↑↓ Modify
```

<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

3. Use the <→> and the <←> keys to select the value on the "Adjust:" line. Then use the <↑> and the <↓> keys to change the selected value.

4. Press <Ent> to store the time. Press <Esc> to return to the SYSTEM MENU.

5. To return to the SYSTEM MENU without storing the time, press <Esc> only.

**Dual Tube Calibration**

To accurately measure respirator–mask–fit, the leakage value due to leakage through the dual tube assembly leak orifice* must be removed from the fit–test leakage value. Calibrating the dual tube assembly accomplishes this.

The dual tube assembly is terminated with an air tight section of tubing. The FitTester 3000 removes air at eight different flow rates. The pressure developed across the leak orifice is measured at each flow rate and stored in an array of calibration data.

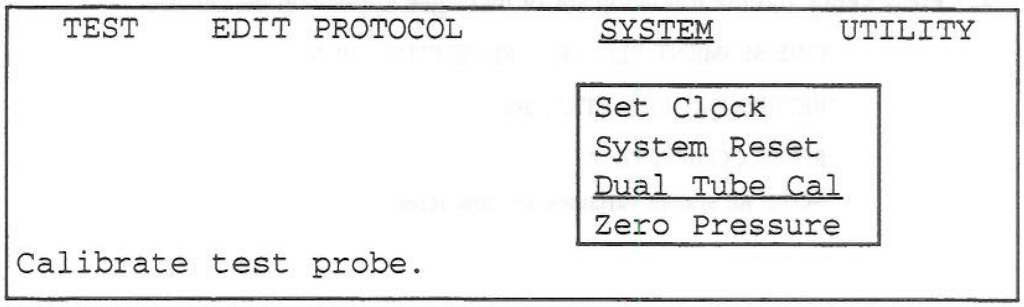
To cancel the effect of orifice leakage during a fit test, an interpolating algorithm uses the array of calibration data to determine orifice leakage at the fit test's particular challenge pressure. This calculated–leakage value is subtracted from the measured–leakage value.

*NOTE 1: The leak orifice is the hole in the gray plastic in one of the female quick–disconnect adapters on the respirator–end of the dual tube assembly.

NOTE 2: Dynatech Nevada recommends that you perform a dual tube calibration before you begin a fit–test session, at the start of the day, or when you use a different dual tube assembly.

Follow these steps to perform the dual tube calibration.

1. Select "Dual Tube Cal" from the SYSTEM MENU as indicated below.




2. Press <Ent>.

3. 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".

4. Press <Ent> and the FitTester 3000 begins calibrating the dual tube assembly. Results are shown on the display as the FitTester 3000 calculates and plots them.

   NOTE: Listed below are the error messages that appear on the display and what action to take.

   - "ERROR–Bypass orifice not within spec."—Replace the dual tube assembly.
   - "ERROR–Check connections and repeat."—Reconnect quick–disconnect adapters and repeat this procedure.
   - "ERROR–Check transducer calibration."—Go to the next diagnostic routine, "Zero Pressure", and remove the offset from the pressure transducer.
   - "ERROR–Replace orifice if necessary."—Replace the dual tube assembly.
   - "Press any key to continue."—Press any key; then you are returned to the SYSTEM MENU.

5. After calibration finishes, press <F5>-SAVE to save the data, or press <F1>-NO–SAVE not to save the data. If you saved the data, you can print it by pressing <F4>-PRINT.

6. Press <Esc> to return to the SYSTEM MENU.

# UTILITY MENU

## Introduction

This section contains instructions on how to use the UTILITY MENU to...

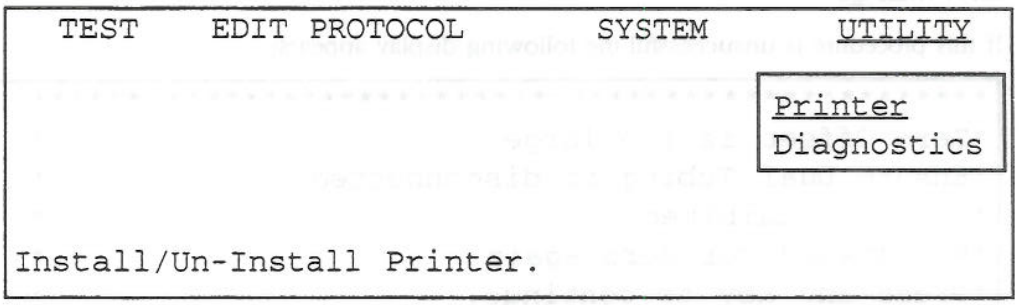
- ... turn on the FitTester 3000 printer port using the printer installation routine.
- ... perform a diagnostic check of the FitTester 3000—diagnostic routines listed below:

1) Speaker Test,
2) Keyboard Test,
3) Display Test,
4) Printer Test,
5) View Cycle Count,
6) Factory Protocol, and
7) Print Help File.

### Printer Installation Routine

The printer installation routine turns the printer port on ("Available") or off ("Not Available").

1. Select "Printer" from the UTILITY MENU as indicated below.

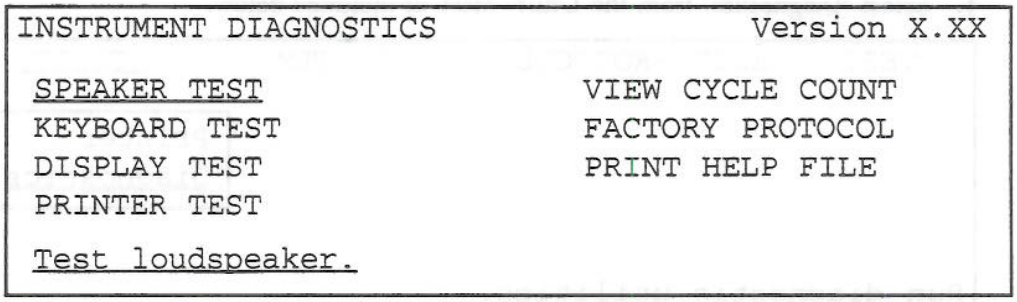



2. Press <Ent>; then press the <↑> or the <↓> key to select "Available" or "Not Available".

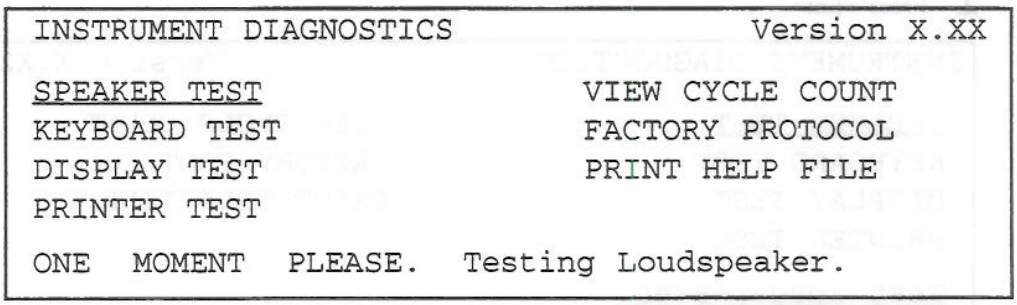
3. Press <Ent> again or press <Esc> to save your setting and return to the UTILITY MENU.

***Speaker Test***

1. From the INSTRUMENT DIAGNOSTICS MENU, select "SPEAKER TEST" using the <↑>, <↓>, <←>, or <→> key—if necessary—to position the highlight bar over "SPEAKER TEST".



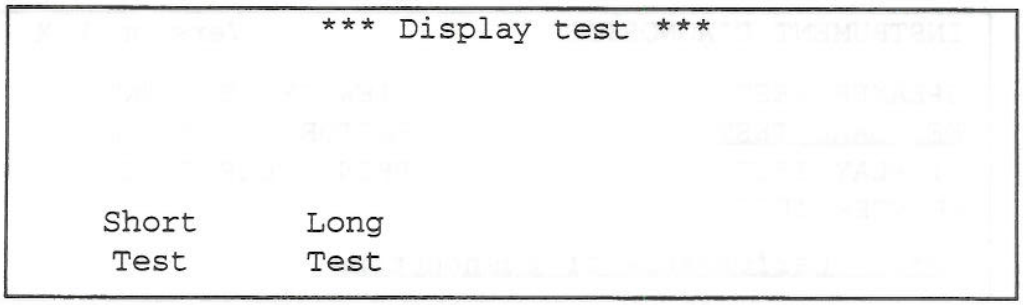

2. Press <Ent>; then a series of tones is output and the display shows:




3. Use the "VOLUME" knob on the lower right front panel to adjust the volume.

***Display Test continued***

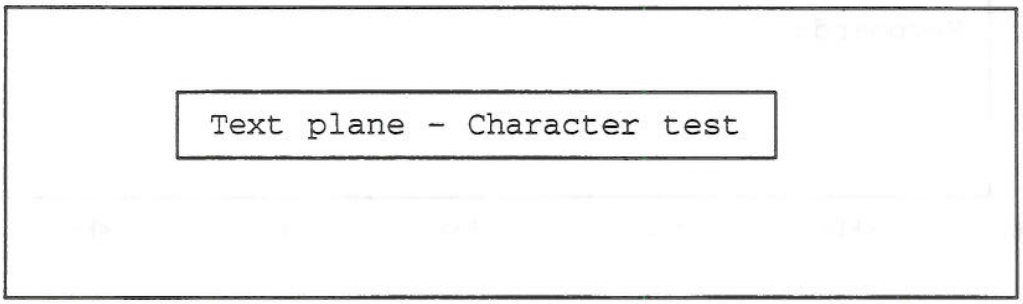
**2.** Press <Ent> and the display shows:



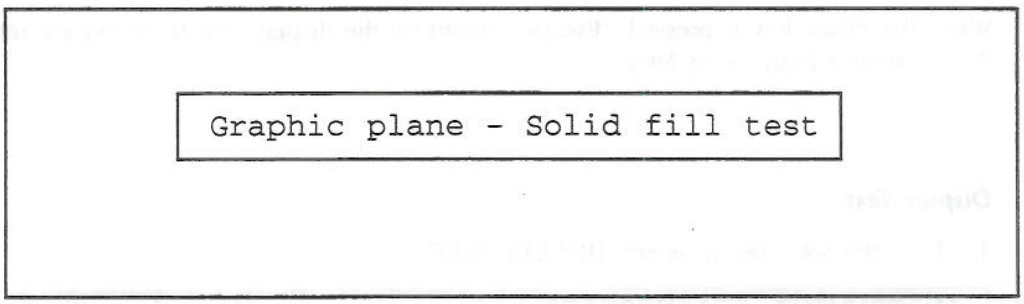

<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

**3.** Next press <F1>-SHORT TEST. First a text plane test, showing all text characters, is performed. Then a graphic plane test, showing a solid fill, is performed. At the end of the "Short Test", press any key to return to the INSTRUMENT DIAGNOSTICS MENU.

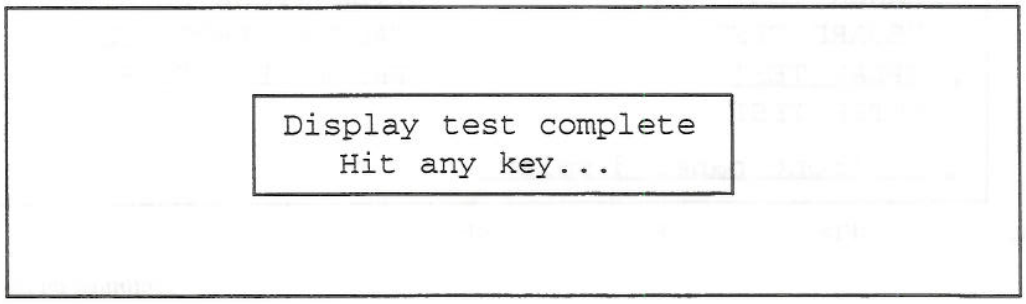
Following are the messages that show on the display during the "Short Test":




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>




<Esc> <F1> <F2> <F3> <F4> <F5> <Ent>

### Printer Test

1. Select "PRINTER TEST" from the INSTRUMENT DIAGNOSTICS MENU.

```
INSTRUMENT DIAGNOSTICS                    Version X.XX

SPEAKER TEST                    VIEW CYCLE COUNT
KEYBOARD TEST                   FACTORY PROTOCOL
DISPLAY TEST                    PRINT HELP FILE
PRINTER TEST

Send test message to printer.

<Esc>      <F1>      <F2>      <F3>      <F4>      <F5>      <Ent>
```

2. Press <Ent>. The FitTester 3000 sends a short message to the printer.
   NOTE: If the message "Printer Not Ready" shows on the display, ensure that the printer is turned on and that the cables are connected properly.

### View Cycle Count

1. Select "VIEW CYCLE COUNT" from the INSTRUMENT DIAGNOSTICS MENU.

```
INSTRUMENT DIAGNOSTICS                    Version X.XX

SPEAKER TEST                    VIEW CYCLE COUNT
KEYBOARD TEST                   FACTORY PROTOCOL
DISPLAY TEST                    PRINT HELP FILE
PRINTER TEST

Determine instrument usage.

<Esc>      <F1>      <F2>      <F3>      <F4>      <F5>      <Ent>
```

2. Press <Ent>. The FitTester 3000 displays the cycle count and an explanation of the cycle count.

```
                    CYCLE COUNT = 13
The cycle count is a measure of how many fit test
exercises have been performed since the unit was
last calibrated. Each time an exercise is completed,
the cycle count is incremented then stored in
memory.
                                        (Press any key)

<Esc>      <F1>      <F2>      <F3>      <F4>      <F5>      <Ent>
```

3. Press any key to returns to the INSTRUMENT DIAGNOSTICS MENU.