FLUKE®

Biomedical

DPM4

Parameter Tester

Users Manual

PN 2631824
April 2006, Rev. 1, 12/07
© 2006, 2007 Fluke Corporation, All rights reserved. Specifications subject to change without notice. Printed in USA
All product names are trademarks of their respective companies.

Warranty and Product Support

Fluke Biomedical warrants this instrument 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 Fluke Biomedical. 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 Fluke Biomedical. IN NO EVENT SHALL FLUKE BIOMEDICAL BE LIABLE FOR CONSEQUENTIAL DAMAGES.

Only serialized products and their accessory items (those products and 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.

Recalibration of instruments is not covered under the 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 Fluke Biomedical's specifications.

Warranty Disclaimer

Should you elect to have your instrument serviced and/or calibrated by someone other than Fluke Biomedical, 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 Fluke Biomedical for factory service and calibration, especially during the original warranty period.

Notices

All Rights Reserved

© Copyright 2007, Fluke Biomedical. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language without the written permission of Fluke Biomedical.

Copyright Release

Fluke Biomedical agrees to a limited copyright release that allows you to reproduce manuals and other printed materials for use in service training programs and other technical publications. If you would like other reproductions or distributions, submit a written request to Fluke Biomedical.

Unpacking and Inspection

Follow standard receiving practices upon receipt of the instrument. Check the shipping carton for damage. If damage is found, stop unpacking the instrument. Notify the carrier and ask for an agent to be present while the instrument is unpacked. There are no special unpacking instructions, but be careful not to damage the instrument when unpacking it. Inspect the instrument for physical damage such as bent or broken parts, dents, or scratches.

Technical Support

For application support or answers to technical questions, either email techservices@flukebiomedical.com or call 1-800- 648-7952 or 1-425-446-6945.

Claims

Our routine method of shipment is via common carrier, FOB origin. Upon delivery, if physical damage is found, retain all packing materials in their original condition and contact the carrier immediately to file a claim. If the instrument is delivered in good physical condition but does not operate within specifications, or if there are any other problems not caused by shipping damage, please contact Fluke Biomedical or your local sales representative.

Standard Terms and Conditions

Refunds and Credits

Please note that only serialized products and their accessory items (i.e., products and items bearing a distinct serial number tag) are eligible for partial refund and/or credit. Nonserialized parts and accessory items (e.g., cables, carrying cases, auxiliary modules, etc.) are not eligible for return or refund. Only products returned within 90 days from the date of original purchase are eligible for refund/credit. 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 carrier chosen by the customer to return the goods, and the product must be returned complete (meaning with all manuals, cables, accessories, etc.) and in "as new" and resalable condition. Products not returned within 90 days of purchase, or products which are not in "as new" and resalable condition, are not eligible for credit return and will be returned to the customer. The Return Procedure (see below) must be followed to assure prompt refund/credit.

Restocking Charges

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.

Return Procedure

All items being returned (including all warranty-claim shipments) must be sent freight-prepaid to our factory location. When you return an instrument to Fluke Biomedical, 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. Fluke Biomedical will not be responsible for lost shipments or instruments that are received in damaged condition due to improper packaging or handling.

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, industry-approved, shock-absorbent material around the instrument.

Returns for partial refund/credit:

Every product returned for refund/credit must be accompanied by a Return Material Authorization (RMA) number, obtained from our Order Entry Group at 1-800-648-7952 or 1-425-446-6945.

Repair and calibration:

To find the nearest service center, goto www.flukebiomedical.com/service or

In the U.S.A.:
Cleveland Calibration Lab
Tel: 1-800-850-4606
Email: globalcal@flukebiomedical.com

Everett Calibration Lab
Tel: 1-800-850-4606
Email: service.status@fluke.com

In Europe, Middle East, and Africa:
Eindhoven Calibration Lab
Tel: +31-402-675300
Email: ServiceDesk@fluke.com

In Asia:
Everett Calibration Lab
Tel: +425-446-6945
Email: service.international@fluke.com

Certification

This instrument was thoroughly tested and inspected. It was found to meet Fluke Biomedical'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.

WARNING

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

Restrictions and Liabilities

Information in this document is subject to change and does not represent a commitment by Fluke Biomedical. Changes made to the information in this document will be incorporated in new editions of the publication. No responsibility is assumed by Fluke Biomedical for the use or reliability of software or equipment that is not supplied by Fluke Biomedical, or by its affiliated dealers.

Manufacturing Location

The DPM4 Parameter Tester is manufactured by Fluke Biomedical, Everett WA.

Table of Contents

Title	Page
Introduction	1
Safety	1
Specifications	3
General	3
Pressure Measurement	4
Temperature Measurement	5
Barometric Pressure	5
Gas Flow	6
Relative Humidity	6
Controls and Connections	6
Powering the Tester	10
Operating the Tester	10
Running Tests	11
Pressure / Temperature	11
Gas Flow / Temperature (Models 2G and 2H)	11
Barometric Pressure and Relative Humidity (Models 2G and 2H)	16
Cleaning the Tester	16

List of Tables

Table	Title	Page
1.	Controls and Connections	8
2.	Pressure and Temperature Tests	13
3.	Gas Flow and Temperature Tests	15

List of Figures

Figure	Title	Page
1.	Controls and Connections	7
2.	Pressure and Temperature Tests	12
3.	Gas Flow and Temperature Tests	14
4.	Barometric Pressure and Relative Humidity	16

DPM4 Parameter Tester

Introduction

The DPM4 Parameter Tester (hereafter called the Tester) is a compact, lightweight, high-performance parameter tester for use by trained service technicians for calibrating or testing medical and industrial devices.

It is a versatile test instrument, able to measure multiple parameters. Basic parameters cover pressure, vacuum, and temperature measurements (Models 1H and 1G).

Gas flow, barometric pressure and humidity measurements are included in the enhanced Tester (Models 2H and 2G). The Tester is menu-driven and simple to operate. All functions are set from a 128 x 32 pixel graphical display.

Safety

⚠⚠Warning. Read before using the Tester.

To avoid personal injury, follow these guidelines:

- **Do not use the Tester in any manner not specified in the Users Manual. Otherwise, the protection provided by this product may be impaired.**
- **Always press power off on the Tester and unplug the Battery Eliminator before cleaning the outer surface.**

- **Inspect the product. If the Tester appears damaged or appears to operate in a manner not specified in the manual, DO NOT CONTINUE USE. Return the product for service.**
- **Avoid spilling liquids on the Tester; fluid seepage into internal components creates corrosion and a potential shock hazard. Do not operate the instrument if there is internal component exposure to fluid.**
- **Do not open this product. There are no user replaceable parts.**

⚠Caution

Calibrate the Tester annually. Only qualified technical personnel should perform troubleshooting and service procedures on the Tester.

Do not expose the Tester to temperature extremes. Ambient operating temperatures should remain between 15 and 35 °C. Tester performance may degrade if temperatures fluctuate above or below this range.

Clean only with a damp, lint-free cloth, using a mild detergent, and wipe down gently.

Symbol	Description
	See Users Manual.
	Caution risk of electric shock
CE	Manufacturer's declaration of product compliance with applicable EU directives
	Battery Eliminator Port
	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

Specifications

General

Display.....LCD graphic display, 128 x 32 pixels
Data Input/Outputs (1).....Bi-directional RS-232C for computer control
Case.....ABS plastic case
Weight.....0.4 kg / 0.9 lbs. with battery
Dimensions.....D x W x H: 34 mm x 94 mm x 156 mm (1.3 in x 3.7 in x 6.1 in)
Environmental.....Indoor use
Temperature, Operating.....15 °C to 35 °C (59 °F to 95 °F)
Temperature, Storage.....0 °C to 50 °C (32 °F to 122 °F)
Maximum Humidity, Operating.....80 % relative humidity up to 31 °C (88 °F), decreasing linearly to 50 % relative humidity at 40 °C (104 °F).
Maximum Humidity, Storage.....95 %
Altitude.....Up to 2000 m

Battery Power Supply

Voltage.....9 VDC
Power Consumption.....< 70 mA
Battery Life.....> 7 hours

External Power Supply

Output Voltage.....12 to 15 V
Output Current.....1.2 A

Models

DPM4-1G	2631330
DPM4-1H	2583121
DPM4-2G	2637772
DPM4-2H	2637760

Standard Accessories

Users Manual CD-ROM	2637785
Users Manual (printed)	2631824
Tubing Kit	2461931
9 VDC Battery Eliminator	2647372

Optional Accessories

PT-100 Temperature Probe	2461910
PT-1000 Temperature Probe	2461922
Expansion Chamber	2461905
Inflation Bulb	2461946

Pressure Measurement

DPM4 Model 1H or 2H

Operating range	-350 to +350 mmHg
Accuracy	± 0.3 % of range
Resolution	0.1 mmHg
Units of measure	mmHg, mBar, cmH_2O, PSI, InHg, InH_2O, $kgcm^2$, and kPa

DPM4 Model 1G or 2G

Operating range	-700 to +5000 mmHg
Accuracy	0.3 % of range for temperatures from 21 to 25 °C and relative humidity from 30 to 70 %; 0.3 % of range plus 0.02 % of range per degree C for temperatures <21 °C or >25 °C with relative humidity from 30 to 70 %

Resolution .....0.5 mmHg
Units of measure .....mmHg, mBar, cmH_2O, PSI, InHg, InH_2O, kgcm^2, and kPa

Temperature Measurement

Operating range.....-40 °C to +200 °C
Accuracy .....±(2 % of reading, +0.5 °C)
Resolution.....0.1 °C and °F
Units of measure .....°C and °F

Use standard external temperature probe type PT-100 or PT-1000 (DIN/IEC 751 Class A) for temperature measurements in °C or °F.

PT-100 Temperature Probe

Operating range .....-50 °C to +200 °C
Accuracy.....0.13 °C @ -100 °C, 0.1 °C @ 0 °C, 0.2 °C @ 100 °C

PT-1000 Temperature Probe

Operating range .....-50 °C to +200 °C
Accuracy.....0.3 °C

Barometric Pressure

DPM4 Model 2G or 2H

It is possible to compensate for sea level and calibrate for offsets.

Operating range .....380 to 900 mmHg
Accuracy.....2 % of reading ±1 LSD
Resolution .....1 mmHg
Units of measure .....mmHg, mBar, inHg, and hPa

Gas Flow

DPM4 Model 2G or 2H

These models measure with an embedded sensor with 11 calibration points to compensate for nonlinearity. The Tester stores calibration constants in firmware.

- Operating range ..... -750 to +750 ml/min
- Accuracy ..... 1 % of range or 5 % of reading, whichever is greater
- Resolution ..... 0.1 ml/min
- Compatibility ..... Air, N2, O_2, CO_2, H2, and He
- Units of measure ..... ml/min (or SCCM - Standard Cubic Centimeters per Minute)

Relative Humidity

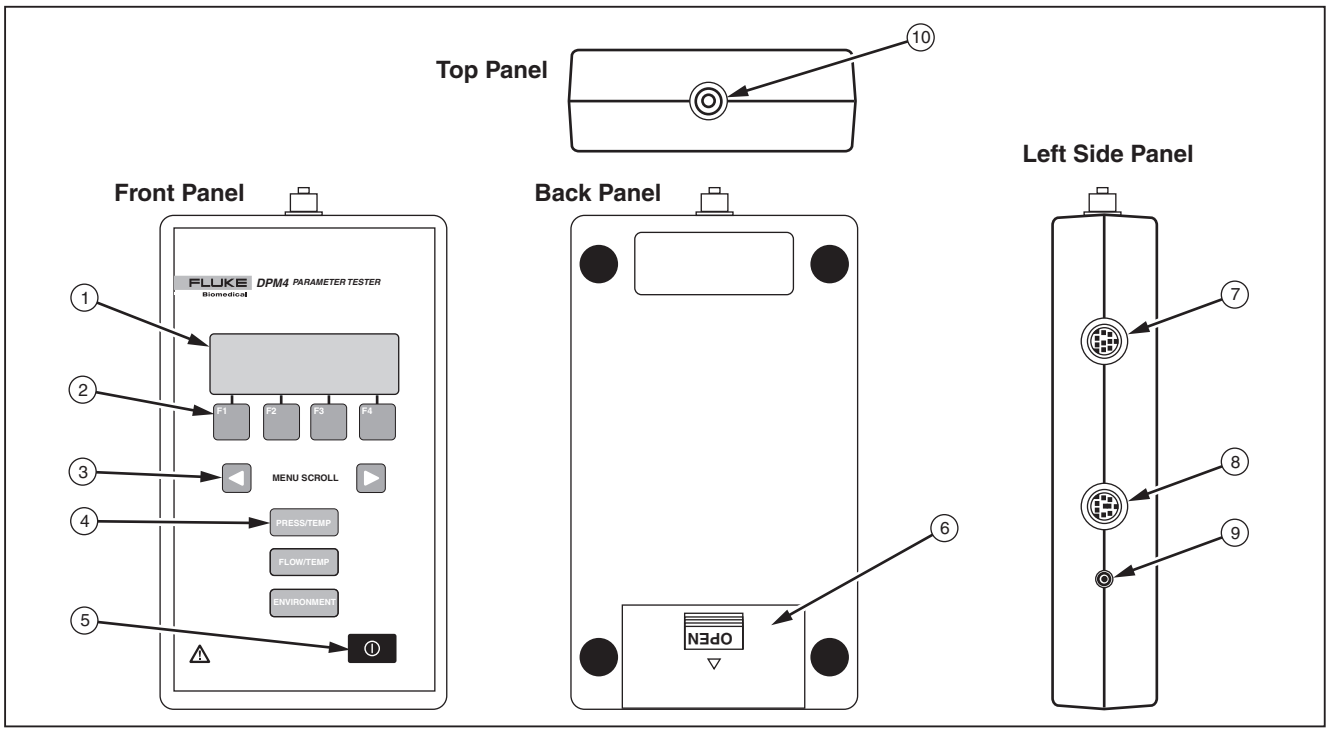
DPM4 Model 2G or 2H

An integrated sensor in the Tester determines relative humidity measurements.

- Operating range ..... 12 to 95 % RH
- Accuracy ..... 3.5 % of reading ±2 % RH @ 25 °C for RH between 12 % and 95 % RH
- Resolution ..... 1 % RH
- Gas compatibility ..... Air
- Units of measure ..... % RH

Controls and Connections

This section describes the controls and connections of the Tester. Refer to Figure 1 and Table 1.



eig01f.eps

Figure 1. Controls and Connections

Table 1. Controls and Connections

Number	Name	Description
①	LCD Display	1.8 cm x 5.8 cm (.7 in. x 2.3 in.) 128 x 32 pixel window displaying messages, test results, and function menus.
②	Function Keys	Used to select various preset test parameter options and run the tests.
③	**MENU SCROLL** Keys	Used to navigate between and confirm the various preset test parameter options.
④	Test Keys	Pressing one of these keys opens the relevant test screen:
	PRESS / TEMP	Pressure / Temperature Test.
	With DPM4 Models 2G and 2H, you can perform the following additional tests:	
	FLOW / TEMP	Gas Flow / Temperature Test.
	ENVIRONMENT	Barometric Pressure / Relative Humidity Test.
⑤	On / Off	Switches the Tester on and off.
⑥	Battery Compartment	Compartment for holding a 9-V alkaline battery.

Table 1. Controls and Connections (cont.)

Number	Name	Description
⑦	Temp.	8-pin mini-DIN plug connector for the temperature cable. Use standard external temperature probe type PT-100 or PT-1000 (DIN/IEC 751 Class A) for temperature measurements in °C or °F.
⑧	RS-232	8-pin mini-DIN plug for connecting an RS-232 cable. Use this connection for uploading new firmware, transferring measuring results, and calibration. You need a customized cable to use this interface.
⑨	Battery Eliminator	For use in operating the Tester from any standard electrical outlet. To ensure safe operation, use only the Fluke Biomedical Battery Eliminator (PN 2647372). **⚠⚠Warning** **Caution risk of electric shock. Use only the Battery Eliminator specified in this manual or the protection provided may be impaired.**
⑩	Pressure	Pressure port connector.

Powering the Tester

The Tester uses a 9-volt alkaline battery. It uses as much of the battery as possible. When it detects less than about 6.8 V, it sounds a continuous tone alarm. When it detects less than 6.0 V, it goes into a shutdown mode

The battery resides in the base of the instrument. Use a 9-volt alkaline battery (Duracell® MN1604 or equivalent). Do not use a mercury, air, or carbon-zinc battery.

⚠ Warning

The 9-volt alkaline battery provided with the Tester may explode or leak if recharged, inserted improperly, disposed of in a fire, or mixed with different battery types. Dispose of the battery in accordance with any applicable state or local regulations.

As an alternative to a battery, you can power the Tester with a Fluke Biomedical Battery Eliminator. To ensure safe operation, use only a Fluke Biomedical Battery Eliminator (PN 2647372).

⚠⚠Warning

Caution risk of electric shock. Use only the Battery Eliminator specified in this manual or the protection provided may be impaired.

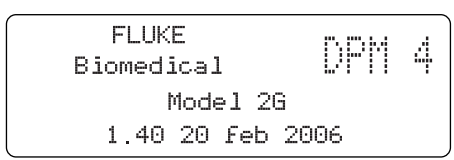
Note

Remove the battery and disconnect the Battery Eliminator if you do not intend to use the Tester for an extended period.

Operating the Tester

Operating the Tester is simple. Make specific connections for the required test. Use the Tester keypad to control the tests.

1. Press the Tester ON. The LCD window displays the Tester model and installed firmware version for about two seconds:



2. The window then displays the pressure / temperature display. This is the default test.

Note

The display indicates when there is a temperature sensor attached to the Tester. Otherwise, "NA" appears in the display.

3. Select the **F1-F4** function keys to set the test parameter presets. Use **MENU SCROLL** ▶ to navigate among the various options. Press the **F1-F4** function key under the required test preset. Press ◀ **MENU SCROLL** to confirm the required preset.

4. **For Tester Models 2G and 2H**, press a test key to go to a test screen other than the default pressure / temperature test. After reaching the required test, select the **F1-F4** function keys to set the test parameter presets. Use **MENU SCROLL** ▶ to navigate among the various options. Press the **F1-F4** function key under the required test preset. Press ◀ **MENU SCROLL** to confirm the required preset.

Running Tests

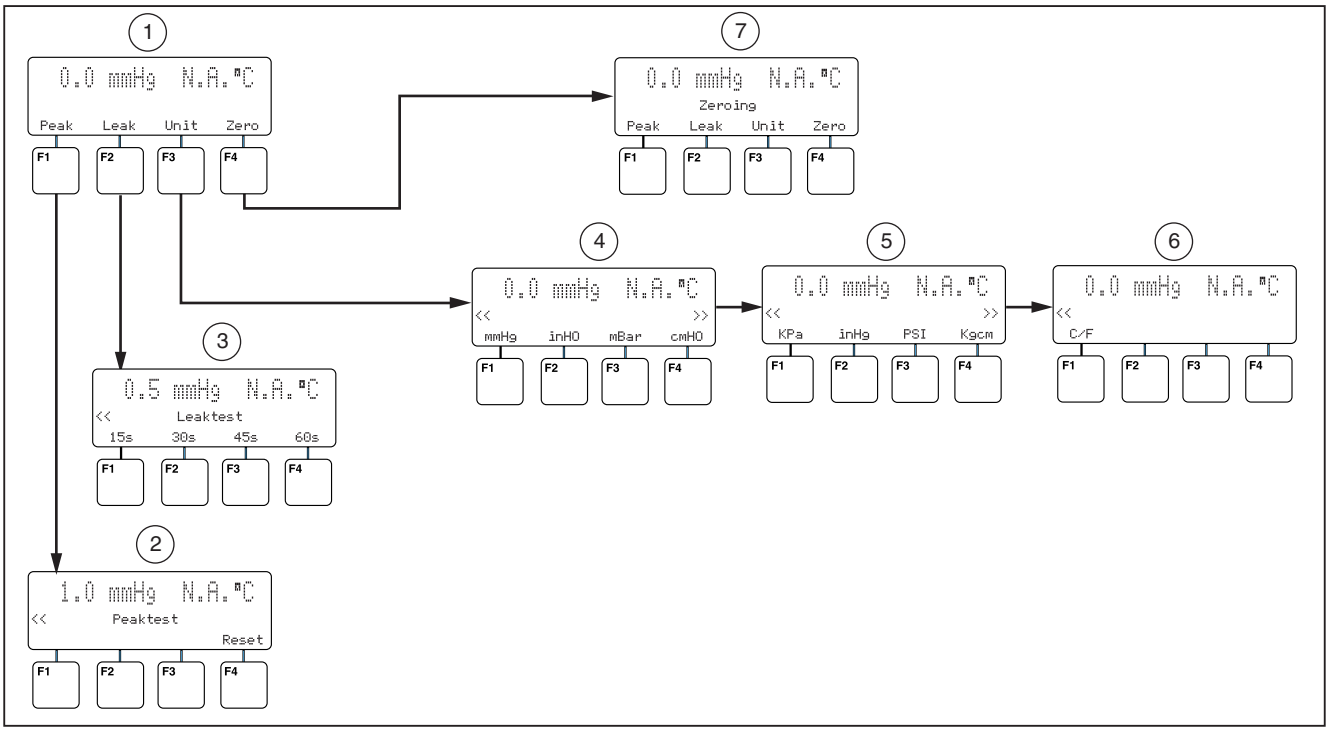
This section describes Tester test procedures by function. If you are unfamiliar with basic Tester operation, refer to "Operating the Tester."

Pressure / Temperature

When you select **PRESS/TEMP**, the selections shown in Figure 2 and described in Table 2 are available.

Gas Flow / Temperature (Models 2G and 2H)

If you select **FLOW/TEMP**, the selections shown in Figure 3 and described in Table 3 are available. The Tester switches on the gas flow sensor power supply. The battery save function prevents turning power on for this circuit beforehand. The sensor needs approximately one minute to warm up before the measuring result is accurate.

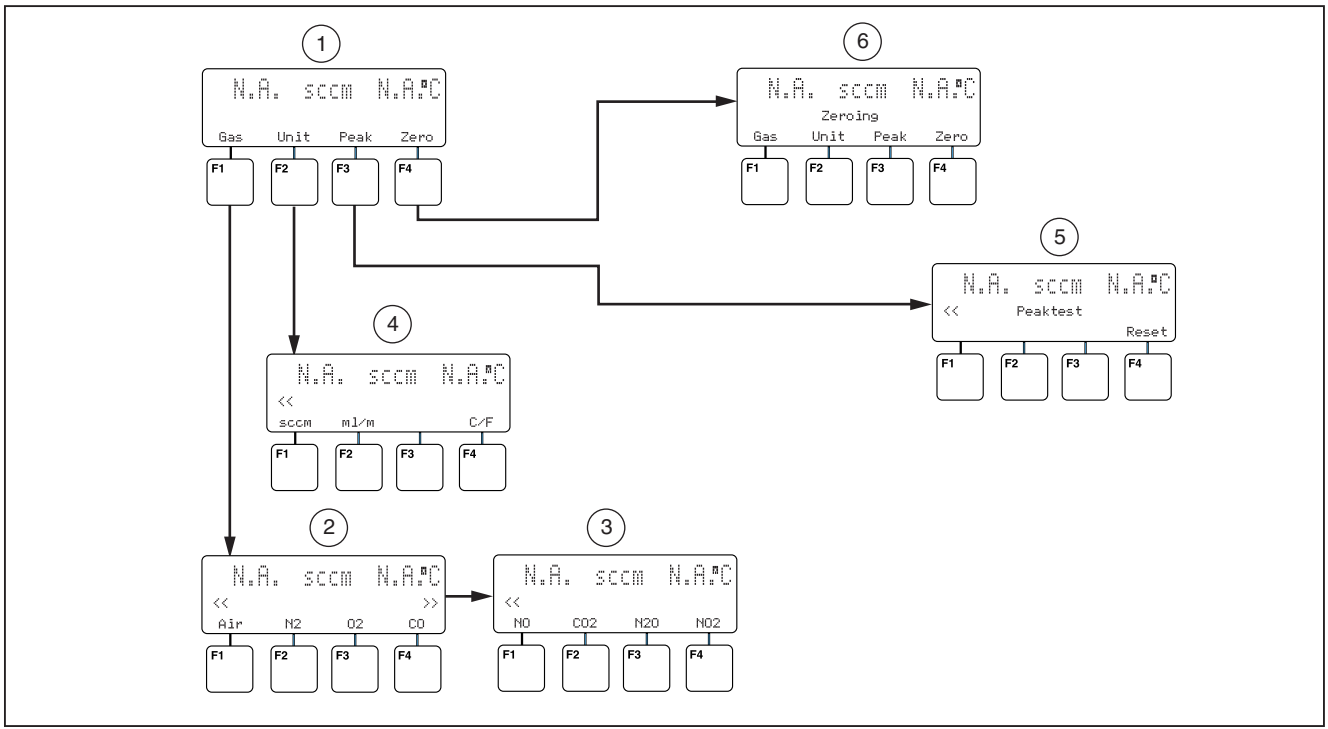


eig16f.eps

Figure 2. Pressure and Temperature Tests

Table 2. Pressure and Temperature Tests

Number	Description
①	**Peak (F1):** The Tester displays Peaktest as long as the measurement is continuing. The Tester displays the highest value of the measurement. You can reset the measurement with the **F4** key. **Leak (F2):** By selecting **F1-F4**, you can set the time for the leak measurement. You can set this interval to 15, 30, 45, or 60 seconds. The Tester displays the time difference between the start and stop pressures. **Unit (F3)**: The Tester can display the result in the following units: mmHg, inHO, mBar, cmHo, kPa, inHg, PSI, Kgcm, and C/F. You can choose sets of selections using **MENU SCROLL ▶** or **◀ MENU SCROLL.** **Zero (F4)**: Resets the pressure measurement. This function should only be used to set zero and not for relative measurements in proportion to a given pressure.
②	Press **◀ MENU SCROLL** to return to the preceding screen. **Reset (F4)** resets the measurement in progress to zero.
③	To start the test, pressurize the circuit. Select the required time for the measurement by pressing the appropriate **F1-F4** key. The result then appears after this time expires. Press **◀ MENU SCROLL** to return to the preceding screen.
④ ⑤ ⑥	Press **MENU SCROLL ▶** to view the available units of measurement. Select the required unit by pressing the appropriate **F1-F4** key. Press **◀ MENU SCROLL** to confirm the selection.
⑦	Resets the pressure measurement.



eig17f.eps

Figure 3. Gas Flow and Temperature Tests

Table 3. Gas Flow and Temperature Tests

Number	Description
①	**Gas (F1)**: Sets the type of gas you are using for the measurement. *Note* *This parameter must be set correctly to make accurate measurements.* **Unit (F2)**: Sets SCCM, ml/min for gas flow, and °C/F for the temperature. **Peak (F3)**: The Tester displays Peaktest as long as the measurement is continuing. The Tester displays the highest measurement value. Reset the measurement with the **F4** key. **Zero (F4)**: Resets the flow measurement. This function should only be used to set zero, and not for relative measurements in proportion to a given pressure.
② ③	Press ◀ **MENU SCROLL** or **MENU SCROLL** ▶ to view the available types of gas. Select the required type of gas by pressing the appropriate **F1-F4** key. Press ◀ **MENU SCROLL** to validate the selection.
④	Select the unit of gas flow with the **F1** or **F2** key, and the unit of temperature with the **F4** key. Press ◀ **MENU SCROLL** to confirm the selection(s). *Note* *An optional PT-100 or PT-1000 temperature probe is necessary for the temperature measurement.*
⑤	Press ◀ **MENU SCROLL** to return to the preceding screen. **Reset** resets the measurement in progress to zero
⑥	Zeros the flow measurement.

Barometric Pressure and Relative Humidity (Models 2G and 2H)

When you have selected **ENVIRONMENT**, the Tester switches on the power supply for the barometric pressure sensor. The sensor needs about ten seconds to warm up before the measurement results are reliable.

Use the **F1** to **F4** keys to select the barometric pressure measuring unit. See Figure 4. The Tester then measures the barometric pressure and the relative humidity. Return by pressing a test key.

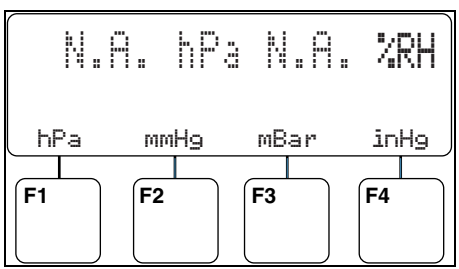


Figure 4. Barometric Pressure and Relative Humidity

Cleaning the Tester

Clean the outside of the Tester using a damp cloth with mild detergent. Please note that some solvents like methanol may damage the overlay and case.

⚠ Caution

Do not pour fluid onto the Tester surface; fluid seepage into the electrical circuitry may cause Tester failure.

⚠ Caution

Do not use spray cleaners on the Tester; such action may force cleaning fluid into the Tester and damage electronic components.