

Digital Pressure Gauge

SERIES CPG 2500



Digital Pressure Gauge SERIES CPG 2500



Warning

This Warning symbol indicates that danger of injury for persons and the environment and/or considerable damage (mortal danger, danger of injury) will occur if the respective safety precautions are not taken.



Caution

This Caution symbol indicates danger for the system and material if the respective safety precautions are not taken.



Notice

This Notice symbol does not indicate safety notices but information for a better understanding of the facts.

Table of Contents

1.	General Information	7
1.1	Warranty	7
1.2	Important Notice	7
1.3	FCC Radio Frequency Emission Notice	8
1.4	Trademarks and Copyrights	8
1.5	Software License Agreement	8
1.6	Mensor Service Plus	9
1.6.1	After the Warranty	9
1.6.2	Calibration Services	9
1.6.3	Accreditations	9
1.7	Packaging for Shipment	9
2.	Safety Notices	10
2.1	User Responsibilities	10
2.2	General Safety Notices	10
2.1	Warnings and Caution Notices	11
3.	Product Description	13
3.1	General Description	13
3.2	Features	13
3.3	Front Panel	14
3.4	Display	14
3.5	Chassis Assembly	15
3.6	Turning on the CPG 2500	15
4.	Specifications	17
5.	Installation	19
5.1	Unpacking the Instrument	19
5.2	Dimensions	19
5.3	Mounting	19
5.4	Rear Panel	20
5.5	Pressure Connections	20
5.5.1	Pressure Port	21
5.5.3	Remote Bus Connections	21

Digital Pressure Gauge SERIES CPG 2500

5.6	Power Up	21
6.	Local Operation	23
6.1	General Operation	23
6.2	Keys and Tabs	23
6.3	Display Screen Features	23
6.4	Tool Bar	24
6.4.1	Contact and Version Information Key	24
6.4.2	Language selection Key	24
6.4.3	Main screen view Key	25
6.4.4	Remote setup Key	26
6.4.5	Remote status Key	26
6.5	Channel Frames	26
6.5.1	Pressure reading window	26
6.5.2	Channel setup Key	26
6.5.2.1	Display Tab	27
6.5.2.1.1	Adjust Function	27
6.5.2.1.2	Measure Function	27
6.5.2.2	Sensor Tab	28
6.5.2.2.1	Standard Pressure Display Mode	28
6.5.2.2.2	Delta Pressure Display Mode	29
6.5.2.2.2.1	Display Tab (Delta)	29
6.5.2.2.2.2	Sensor Tab (Delta)	30
6.5.2.2.2.3	Adjust Tab (Delta)	30
6.5.2.2.2.4	Data Tab (Delta)	30
6.5.2.3	Adjust Tab	31
6.5.2.3.1	Zero	31
6.5.2.3.2	Head Correction	31
6.5.2.4	Data Tab	32
6.5.3	Pressure Units Key	33
6.5.3.1	English Tab	33
6.5.3.2	Metric Tab	34
6.5.3.3	User units Tab	34

7.	Remote Operation	35
7.1	Remote Setup	35
7.1.1	Instrument Tab	35
7.1.1.1	Emulation Mode	35
7.1.1.2	Channel	35
7.1.2	Ethernet Tab	36
7.1.3	Serial Tab	37
7.1.3.1	Cable Requirements	37
7.1.3.2	Command and Query Format	38
7.1.3.3	Command Set Definitions	38
7.1.3.4	Output Formats	39
7.1.3.5	Commands and Queries	39
7.1.3.6	Units Command Syntax	44
7.1.3.7	CPG 2500 Error Codes	45
7.1.3.8	Remote Emulation	46
7.1.3.8.1	DPG 2100 Emulated Commands and Queries	46
7.1.3.8.2	Units Command Syntax for DPG 2100 Measurement Units	52
7.1.3.8.3	DPG II Models 14000/15000 Terse Message Set Emulation	54
7.1.3.8.4	General SCPI WIKA Commands	58
7.1.3.8.4.1	Error Messages and Error Codes	60
7.1.4	IEEE-Tab (option)	61
7.1.4.1	GPIB Capability Codes	61
7.1.4.2	Interface Functions	62
7.1.4.3	IEEE-488.2 Commands	62
8.	Options	63
8.1	Barometric Reference Transducer	63
8.1.1	Gauge Pressure Emulation	63
8.1.2	Absolute Pressure Emulation	63
8.1.3	Calibration	64
8.1.4	Specifications	64
8.2	Barometer	64
8.2.1	Zero and Sea Level Adjustment	64
8.2.2	Calibration	66

Digital Pressure Gauge SERIES CPG 2500

8.2.3	Specifications	66
8.3	Analog Output	66
8.3.1	Command Set for Analog Output Option	67
8.3.2	Zero and Span Adjustment	68
8.3.3	Specifications	69
8.4	IEEE-488 (GPIB) (see 7.1.4)	70
8.5	Rack Mount Kit (optional accessory)	70
9.	Maintenance	71
9.1	Beyond the Warranty	71
9.2	Spare Parts	72
9.3	Replacing the fuse	72
10.	Calibration	73
10.1	Environment	73
10.2	Pressure Standards	73
10.3	Calibration Medium	73
10.4	Setup	74
10.5	Calibration Process	75
10.5.1	Sensor Tab	76
10.5.2	Utility Tab	76
10.5.2.1	Zero and Head Correction	76
10.5.2.2	Restore Factory Cal	77
10.5.2.3	Change Password	77
10.5.2.4	Date of Calibration	77
10.5.3	Edit Tab	78
10.5.4	Calibrate Tab	78
10.5.4.1	Procedure 1: 'As found' Data	79
10.5.4.2	Procedure 2: Active Calibration	79
11.	Appendix	81
11.1	Measurement Units	81
11.2	Conversion Factors, psi	82
11.3	Conversion Factors, millitorr	84
11.4	Conversion Factors, pascal	85

1. General Information

1.1 Warranty

All products manufactured by Mensor® Corporation (Mensor) are warranted to be free of defects in workmanship and materials for a period of one year from the date of shipment. No other express warranty is given, and no affirmation of Seller, by words or actions, shall constitute a warranty. SELLER DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSES WHATSOEVER. If any defect in workmanship or material should develop under conditions of normal use and service within the warranty period, repairs will be made at no charge to the original purchaser, upon delivery of the product(s) to the factory, shipping charges prepaid. If inspection by Mensor or its authorized representative reveals that the product was damaged by accident, alteration, misuse, abuse, faulty installation or other causes beyond the control of Mensor, this warranty does not apply. The judgment of Mensor will be final as to all matters concerning condition of the product, the cause and nature of a defect, and the necessity or manner of repair. Service, repairs or disassembly of the product in any manner, performed without specific factory permission, voids this warranty.

MENSOR MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MANUAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Mensor shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

1.2 Important Notice

The product specifications and other information contained in this manual are subject to change without notice.

Mensor has made a concerted effort to provide complete and current information for the proper use of the equipment. If there are questions regarding this manual or the proper use of the equipment, contact Mensor at:

TEL	1.512.396.4200	WEB SITE	www.mensor.com
TEL	1.800.984.4200 (U.S.A. only)	E-MAIL	sales@mensor.com
FAX	1.512.396.1820		tech.support@mensor.com

Copyright © 2005, Mensor Corporation. All rights reserved.

Digital Pressure Gauge SERIES CPG 2500

1.3 FCC Radio Frequency Emission Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

USE SHIELDED CABLES TO CONNECT EXTERNAL DEVICES TO THIS INSTRUMENT TO MINIMIZE RF RADIATION.

1.4 Trademarks and Copyrights

Mensor is a registered trademark of Mensor Corporation. All other brand and product names are trademarks or registered trademarks of their respective companies. ©2007, Mensor Corporation. All rights reserved.

Korean font: Copyright (C) 1987, 1988; Daewoo Electronics Co., Ltd.

Chinese font: Copyright (C) 1988; The Institute of Software, Academia Sinica. Correspondence address: P.O. Box 8718, Beijing, China 100080.

1.5 Software License Agreement

This product contains intellectual property, i.e., software programs, that are licensed for use by the end user/customer (hereinafter “end user”).

This is not a sale of such intellectual property.

The end user shall not copy, disassemble or reverse compile the software program.



Notice

The software programs are provided to the end user “as is” without warranty of any kind, either express or implied, including, but not limited to, warranties of merchantability and fitness for a particular purpose. The entire risk of the quality and performance of the software program is with the end user.

Mensor and its suppliers shall not be held to any liability for any damages suffered or incurred by the end user (including, but not limited to, general, special, consequential

or incidental damages including damages for loss of business profits, business interruption, loss of business information and the like), arising from or in connection with the delivery, use or performance of the software program.

1.6 Mensor Service Plus

If you have problems and you don't find the answer in this manual, contact Mensor at 1.800.984.4200 (USA only) or 1.512.396.4200 for personal assistance, or at any of the contact addresses listed on the rear cover of this manual. We are ready to help.

1.6.1 After the Warranty

Mensor's concern with the performance of this instrument is not limited to the warranty period. We provide complete repair, calibration and certification services after the warranty for a nominal fee.

1.6.2 Calibration Services

In addition to servicing our own products Mensor can perform a complete pressure calibration service, up to 20,000 psi, for all of your pressure instruments. This service includes an accredited calibration.

1.6.3 Accreditations

Mensor Corporation is registered to ISO 9001:2008. The calibration program at Mensor is accredited by A2LA, as complying with both the ISO/IEC 17025:2005 and the ANSI/NCSL Z540-1-1994 standards.

1.7 Packaging for Shipment

If the product must be shipped to a different location or returned to Mensor for any reason through a common carrier it must be packaged properly to minimize the risk of damage.

The recommended method of packing is to place the instrument in a container, surrounded on all sides with at least four inches of shock attenuation material such as styrofoam peanuts.

2. Safety Notices

2.1 User Responsibilities

To ensure safety, the user must make sure that:

- The system is used properly, no dangerous media are used and that all technical specifications are observed.
- The system is operated in perfect operating condition.
- This operation manual is legible and accessible to the user at the system's location.
- The system is operated, serviced and repaired only by authorized and qualified personnel.
- The operator receives instruction on industrial safety and environmental protection, and is knowledgeable of the operating instructions and the safety notices contained therein.

2.2. General Safety Notices



Notice

The system should only be operated by trained personnel who are familiar with this manual and the operation of the instrument.



Warning

WARNING: A condition for trouble-free and safe operation of this system is proper transport, proper storage, installation, assembly and proper use as well as careful operation and maintenance. Any operation not described in the following instructions should be prohibited. The system must be handled with care required for an electronic precision instrument (protect from humidity, impacts, strong magnetic fields, static electricity and extreme temperatures). Do not insert any objects into the instrument. The system is powered via the power cable with a voltage that can cause physical injury. Even after disconnecting the system from the power supply, dangerous voltages can temporarily occur due to capacitance. Extreme care must be taken with pressure connections when using hazardous or toxic media. Repairs must only be performed by authorized service personnel.



Notice

Additional safety notices are found throughout this manual.

2.3 Warnings and Caution Notices



Warning

WARNING: HIGH PRESSURE! High pressure gases are potentially hazardous. Energy stored in these gases and liquids can be released suddenly and with extreme force. High pressure systems should be assembled and operated only by personnel who have been trained in proper safety practices.



Warning

WARNING: NOT EXPLOSION PROOF! Installation of this instrument in an area requiring devices rated as intrinsically safe is not recommended.



Warning

WARNING: POSSIBLE INJURY! The tubing, valves, and other apparatus attached to the gauge must be adequate for the maximum pressure which will be applied, otherwise physical injury to the operator or bystanders is possible.



Caution

CAUTION: USE THE PROPER PRESSURE MEDIUM! Use only clean, dry, non-corrosive gases unless otherwise specified by Mensor. This instrument is not designed for oxygen use.

Digital Pressure Gauge SERIES CPG 2500



Caution

CAUTION: As with most sensitive electronic equipment, switch the power switch off before connecting or disconnecting to a power source to prevent data loss.



CAUTION: ESD PROTECTION REQUIRED. The proper use of grounded work surfaces and personal wrist straps are required when coming into contact with exposed circuits (printed circuit boards) to prevent static discharge to sensitive electronic components.

Additional Warning and Caution notices are found throughout this manual.

3. Product Description

3.1 General Description

The CPG 2500 Digital Pressure Gauge is a multi-channel pressure system designed to test and calibrate a variety of pressure devices in either absolute or gauge pressure modes. The CPG 2500 can have two independent measurement channels plus an optional barometric reference.



Figure 3.1 - Front View

3.2 Features

Here is a short list of significant features designed into the CPG 2500:

1. Up to two highly stable, temperature compensated, pressure transducers.
2. An optional internal high accuracy barometric reference transducer provides gauge pressure emulation for all of the absolute ranges and absolute pressure emulation for gauge ranges.
3. A color HVGA display with a touch screen for intuitive operator interface.
4. Multiple languages; change the language for on-screen text and number/date formats by simply touching one of the “national flag” icons available on the display. The current language selections available are listed in Section 6, Local Operation, under the heading “Language selection key”.

Operate the CPG 2500 while it is either sitting on a bench or mounted in a standard equipment rack. Use either front panel input (Local Operation), or send commands and queries over a bus from a separate “host” controller (Remote Operation).

Digital Pressure Gauge SERIES CPG 2500

3.3 Front Panel

The CPG 2500 front panel includes a 6.2 inch color Half Video Graphics Array (HVGA) liquid crystal display featuring touch screen technology. Operator input is accomplished by pressing the words or icons presented on the display. There are no discrete keypads or switches on the front panel.

On the lower right hand side of the front panel there are labels which show the model number, serial number, and calibrated pressure ranges of the internal transducers.

3.4 Display

When the CPG 2500 is powered up it takes about one minute to initialize, then displays a screen similar to the one shown in “6.3 - Display Screen Features”. The display is made up of rectangles that display text or icons.

Keys, Tabs, Labels and Windows: In this manual a key is a small rectangle which acts as a switch when pressed. Keys have borders with a three dimensional, shadowed effect. Tabs are a group of touch points, each of which will overlay most of the screen with one page related to its title subject. Small rectangles with double line borders that display information, but do not respond to being touched, are called Labels or Windows.

Keys cause something to change when they are touched. Each key has a characteristic response when actuated; either an instant, single step response when the key is pressed, or a delayed response when released. Operators will quickly become accustomed to the particular characteristics of the frequently used keys. Some keys become labels under certain conditions, then resume their key function in other circumstances.

Main Screen: The main screen appears after power-up. This screen contains the channel frames and toolbar.

Channel Frame(s): The channel frames contain information specific to a channel. The channel frames are color coded with channel A being green and channel B being blue. The Delta channel is yellow. If only one channel is installed, a wide frame will be displayed in the color of the channel selected. The channel frame contains the channel setup key (wrench icon), the channel title bar, the calibration function key (if enabled), the engineering units key, the pressure reading window, and the display function windows/keys (if enabled).

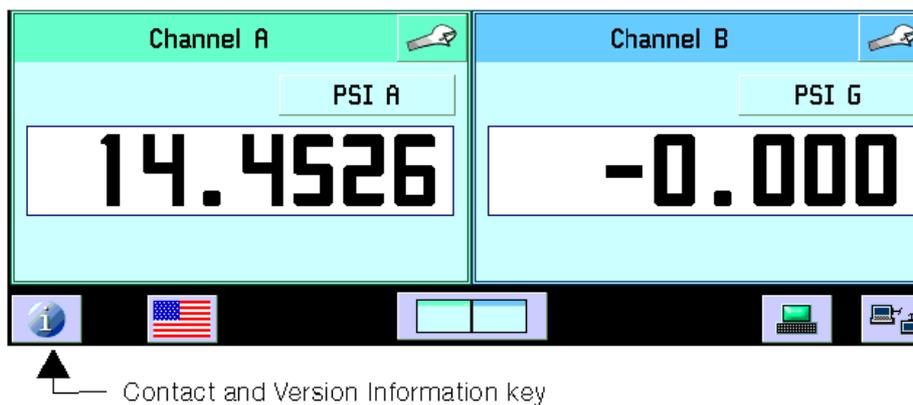
Toolbar Keys: The toolbar at the bottom of the screen has the Contacts and Version Information key (brings up a corporate information display), the language selection key, the main screen view key, the remote setup key, and the remote status key.

3.5 Chassis Assembly

The chassis assembly acts as the housing for the system. The system has no user-serviceable parts except for the fuse, and therefore the chassis should not be opened except by qualified repair personnel at Mensor or certified service locations for any other reason.

3.6 Turning on the CPG 2500

You can confirm that your CPG 2500 is operational right now. Apply power to the power connector on the rear of the instrument with the included power adapter, remove any plastic plugs from the rear panel pressure ports, and press the power switch to ON. The system will go through an initialization process and then a display will appear similar to the screen shown below.



Touch the Contact and Version Information key on the toolbar and a window will appear listing the Mensor customer service contact and software version information. Press the back key to return to the main screen.



**Digital Pressure Gauge
SERIES CPG 2500**

NOTES

4. Specifications

Accuracy specifications presented herein are obtained by comparison with primary standards traceable to the National Institute of Standards and Technology (NIST). These specifications are obtained in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). The calibration program at Mensor is accredited by the American Association of Laboratory Accreditation (A2LA) as complying with both the ISO/IEC 17025:2005 and the ANSI/NCSL Z540-1-1994 standards. If there is an exception to the requirements and recommendations of Z540 during a calibration the exception is noted on the individual calibration certificate.

Mensor reserves the right to change specifications without notice.

This table shows available ranges in psi corresponding to the mode and total uncertainty.		
Mode ↓ \ Total Uncertainty →	0.01% FS	0.01% IS-50*
Gauge	0...36 to 0...10,000	0...15 to 0...6,000
Bi Directional	-0.18 ... 0.18 to -15 to 10,000	Not available
Absolute	0...5 to 0...10,000	0...15 to 0...6,000

*0.01% IntelliScale-50 (0.01% IS-50) is defined as a total uncertainty of 0.005% of full scale (FS) from 0% to 50% of FS and 0.01% of reading from 50% to 100% of FS.

Compensated temp range	°C	15 ... 45
Calibration interval	days	180
Pressure units		psi, inHg @ 0°C and 60°F, inH ₂ O @ 4°C, 20°C and 60°F, ftH ₂ O @ 4°C, 20°C and 60°F, mTorr, inSW @ 0°C, ftSW @ 0°C, ATM, bar, mbar, mmH ₂ O @ 4°C, cm H ₂ O @ 4°C, MH ₂ O @ 4°C, mmHg @ 0°C, cmHg @ 0°C, Torr, kPa, Pa, Dy/cm ² , g/cm ² , kg/cm ² , mSW @ 0°C, OSI, PSF, TSF, TSI, µHg @ 0°C, hPa, mPa, mmH ₂ O 20°C, cmH ₂ O 20°C, MH ₂ O 20°C. All seawater units are 3.5% salinity.
Pneumatic interfaces		To 6000 psi: 7/16 - 20 female SAE/MS. 1/8" FNPT adapters provided. Ranges >6000 psi: Autoclave F250C/HIP HF4. Reference port standard < 20 psi FS, optional 20 psi FS

Digital Pressure Gauge SERIES CPG 2500

Pressure media		Clean, dry, non-corrosive, non-combustible, non-oxidizing gases. Not suitable for oxygen use
Display		6.2" color LCD with 4 wire resistive touch screen
Resolution	digits	6 significant digits (up to 1 ppm); user selectable.
Warmup time	min	Approximately 15 minutes to achieve full accuracy depending on environment.
Remote user interfaces		Standard: RS-232 and Ethernet Optional: IEEE-488 and Analog Output
Power input requirements		+5 VDC, 3 A min. Fuses: Littelfuse® 0454 002
Operating temp range	°C	0° ... 50 Note: This is not the compensated temperature range.
Storage temp range	°C	0° ... 70. Minimal vibration. Non-condensing humidity.
Orientation effects		Negligible, can be removed with re-zeroing.
Weight	lbs.	<5
Dimensions	in. (cm)	8.37" wide x 3.47" high x 9.00" deep (21.26 cm x 8.81 cm x 22.86 cm). Half rack width x 2U x 9" deep. Feet: .96 wide x .60" high x 3.10" deep (2.44 cm x 1.52 cm x 7.87 cm).
Compliance		The CPG 2500 is compliant to: EN 61326-1:1997 EN 61326-1:A1:1998 EN 61326-1:A2:2000 EN 61000-3-2:2000 EN 61000-3-3:1995
Reading rate		50ms, 20 readings per second
Operating environment		5 to 95% RH non-condensing
Options		Optional Output: Barometric Reference Transducer, Barometer, IEEE-488 GPIB Interface, Analog Output. Optional Accessories: Rack Mount Kit

5. Installation

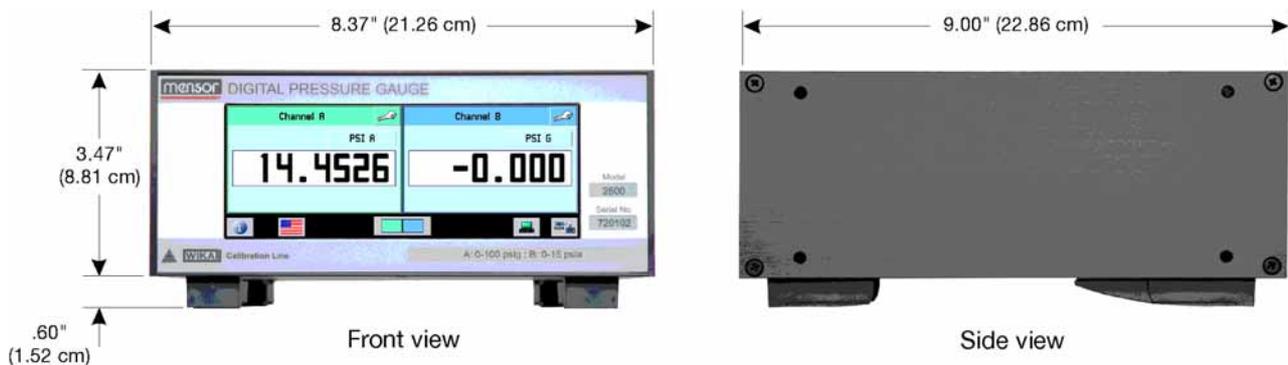
5.1 Unpacking the Instrument

In addition to functional testing, each unit is inspected for appearance prior to leaving the factory. Upon receipt, please examine the transducer for shipping damage. Report any apparent damage to the carrier immediately.

In addition to this manual you should have:

- CPG 2500 Digital Pressure Gauge;
- Power Supply;
- 1/8 inch FNPT fitting adapters;
- Any accessories ordered;
- An envelope containing the Calibration Certificate.

5.2 Dimensions



5.3 Mounting

The instrument can be set up on a table top or it can be rack-mounted. Rack mount adapters are optional on the CPG 2500 (see Section 8, Options).

The special sensors used in the CPG 2500 are relatively insensitive to tilt and vibration. However to further assure stability and accuracy, avoid mounting the instrument on surfaces subject to excessive motor or machinery vibration.

Digital Pressure Gauge SERIES CPG 2500

5.4 Rear Panel

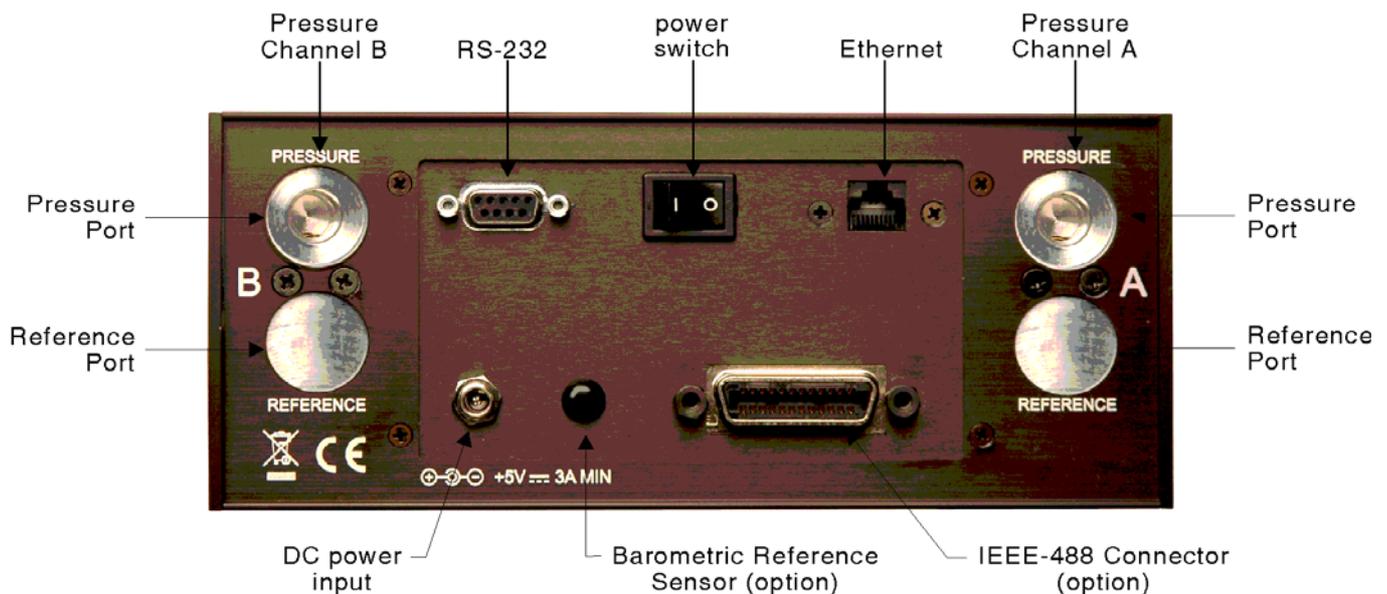
Up to five pneumatic pressure ports are located on the rear panel. Positioned between the pressure ports are the ethernet and RS-232 connectors and the power switch. Optional connectors could be a GPIB connector, a barometric reference hose barb, or an analog output connector.

5.5 Pressure Connections



Notice

When making up a connection to an o-ring adapter fitting port use a back-up wrench to prevent over-stressing the threads in the manifold block.



All of the primary pressure ports on the rear are female 7/16 - 20 SAE/MS straight threads per MS16142 and SAE J514 table 14. They require a tube fitting boss seal with an o-ring per MS33656. Mensor provides female 1/8" NPT adapter fittings with the instrument. The pressure connections can be made to these adapters with the proper mating hardware. We recommend the use of either Loctite® Hydraulic Sealant or new teflon tape on the threads of any male pipe fitting. Do not use sealant on fittings sealed with an o-ring. The integrity of each seal is particularly important since even microscopic leaks can cause errors in pressure measurements.

5.5.1 Pressure Port

Connect a device to be tested to the PRESSURE port. The CPG 2500 will precisely measure the pressure at this port up to the full scale range of the sensor.

5.5.2 Reference Port

On low pressure (< 20 psi) gauge units this port is available to connect to the reference side of the transducer. The maximum value is equal to or less than the range of the sensor or 20 psi, whichever is less. This port is normally left open to atmosphere but may be connected to a stable reference pressure. It is optionally available on all gauge ranges ≤ 6000 psi.

5.5.3 Remote Bus Connections

See Section 7, Remote Operation, for connections and commands for operation over the Ethernet or RS-232 serial port.

5.6 Power Up

After the pressure connections are secure, apply power to the power connector on the rear of the instrument and switch the power switch ON. The instrument will go through an initialization process and system check. As soon as the system check is completed the system will default to a screen similar to the one shown in Section 6.3 - Display Screen Features. Allow at least 15 minutes of warm up before performing critical pressure measurements.

**Digital Pressure Gauge
SERIES CPG 2500**

NOTES

6. Local Operation

6.1 General Operation

This section describes the procedures for operating the CPG 2500 from the front panel. Instructions for operating the device remotely from an external computer are covered in Section 7, Remote Operation. By following the procedures provided in these two sections and Section 10, Calibration, you can expect your CPG 2500 to deliver maximum accuracy and dependability for many years of useful service.

6.2 Keys and Tabs

Local operation is accomplished by observing the data presented in the display, then pressing the on-screen key or tab for the desired function. The back key is in the upper left corner of all screens except for the main screen. It is used to return to the previous screen.

6.3 Display Screen Features

The screen shown below provides a brief description of the features shown on a dual channel display after initialization. Additional keys will appear on this screen if activated (zero, tare, peak and rate). All of the CPG 2500 screen features are described in more detail throughout this manual.

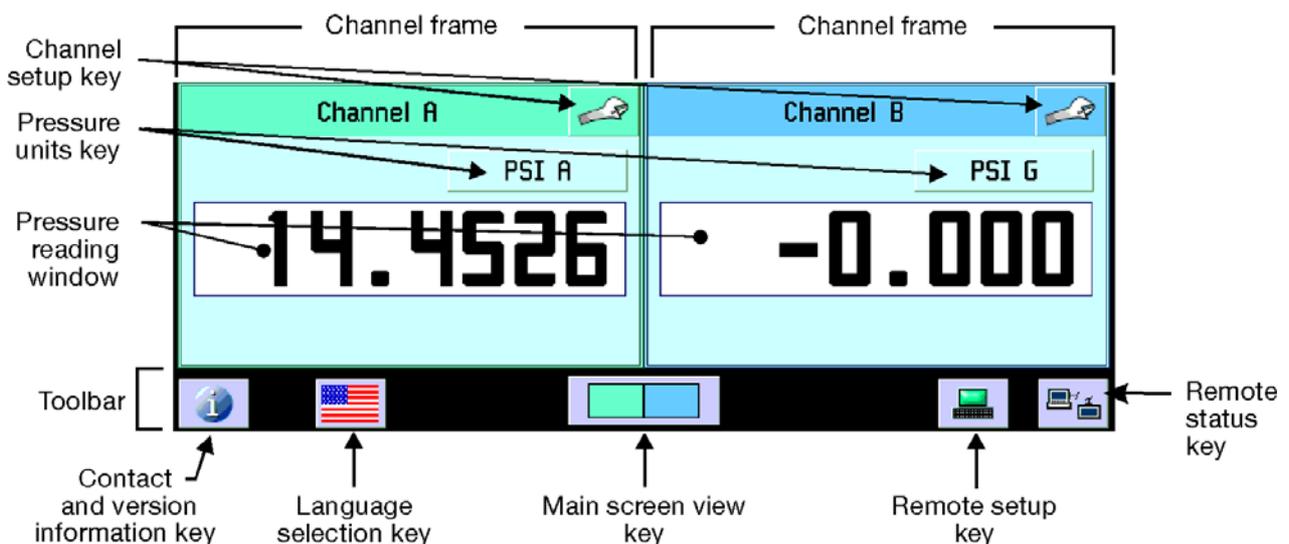


Figure 6.3 - Display Screen Features

Digital Pressure Gauge SERIES CPG 2500

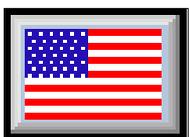
6.4 Toolbar

6.4.1 Contact and Version Information Key



Press this key to display Mensor contact, instrument and software version information.

6.4.2 Language Selection Key



The flag icon on the toolbar is a key that indicates the language used in all screens. Press this key to select the language used for local operation. The current language selections available are:

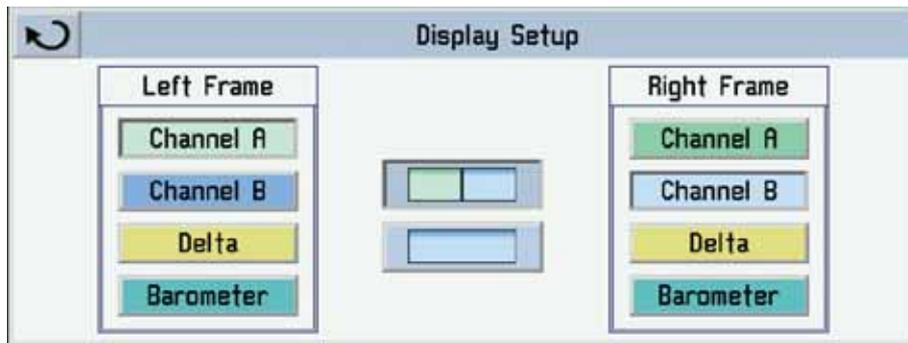
Language	Country
English	USA
German	Germany
French	France
Spanish	Spain
Italian	Italy
Chinese	China
English	Great Britain
German	Switzerland
French	Switzerland
Spanish	Mexico
Russian	Russia
Korean	Korea
English	Canada
French	Canada
Polish	Poland
Japanese	Japan



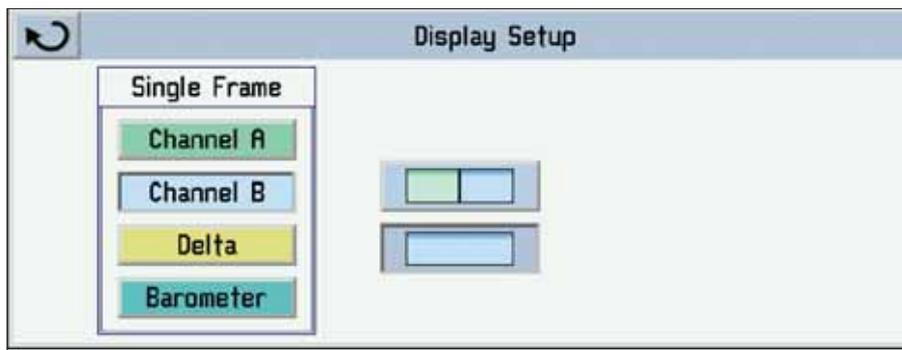
6.4.3 Main Screen View Key



Press this key to configure the channel displayed on the main screen.



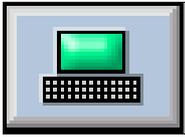
Select a channel to display on the left and right frames or press the single channel display key in the middle to select a single channel.



To return to a dual channel display screen press the dual channel display key, select the desired channels and return to the main screen by pressing the back key.

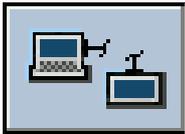
Digital Pressure Gauge SERIES CPG 2500

6.4.4 Remote Setup Key



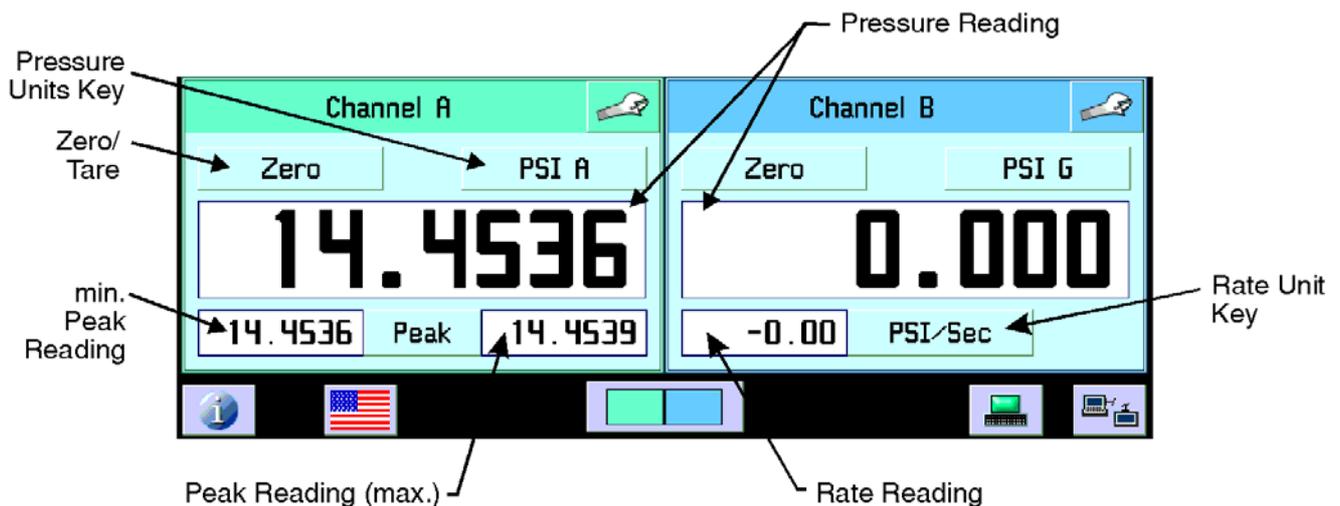
Press this key to set the operating parameters for Instrument emulation, Ethernet, Serial RS-232 or optional IEEE-488. For further information see Section 7, Remote Operation.

6.4.5 Remote Status Key



Press this key to view the remote communications monitor. The remote monitor displays detailed information that is helpful to troubleshoot programs.

6.5 Channel Frames



6.5.1 Pressure Reading window

This window always displays the current pressure reading.

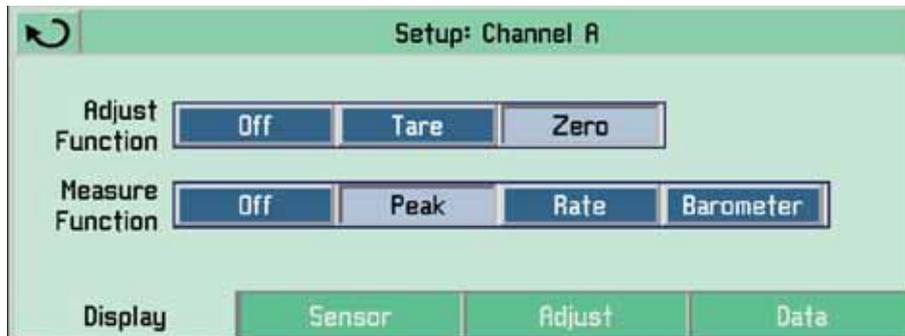
6.5.2 Channel Setup Key



Press this key to access setup functions for a channel. The channel setup screen has four tabs that group related types of settings.

6.5.2.1 Display Tab

Press the display tab to configure the measure and adjust functions.



6.5.2.1.1 Adjust Function

The adjust function will add a Tare or Zero key on the upper left above the pressure reading window. If these features are not desired, select Off.

Tare: Allows the user to temporarily set the measured pressure reading to zero. Press the key again to return the reading to the true pressure.

Non-Password Protected Zero: Allows the user to zero the measured pressure reading. On gauge transducers, vent the pressure port to atmosphere and press the Zero key. When the Zero key is pressed on an absolute sensor, a number entry keypad is displayed to allow the user to enter the applied pressure. When power is cycled the zero is saved in the sensor through the password protected zero function (see Section 6.5.2.3 - Adjust Tab). It will also return to the most recent factory calibrated zero when the "Reset Factory Cal, OK" key is pressed (see Section 10.5.2 - Utility Tab). This feature must be enabled in the Adjust settings to be available. See Section 6.5.2.3 - Adjust Tab for more information.

6.5.2.1.2 Measure Function

The measure function will add peak, rate or the optional barometric sensor reading below the pressure reading window. If these features are not desired, select Off.

Peak: Displays the highest and lowest pressure points since the last reset or power up.

Rate: Reports the rate at which the measured pressure is changing. Press the Rate Unit key on the main menu screen to select among the four time scales: second, minute, hour and three hours.

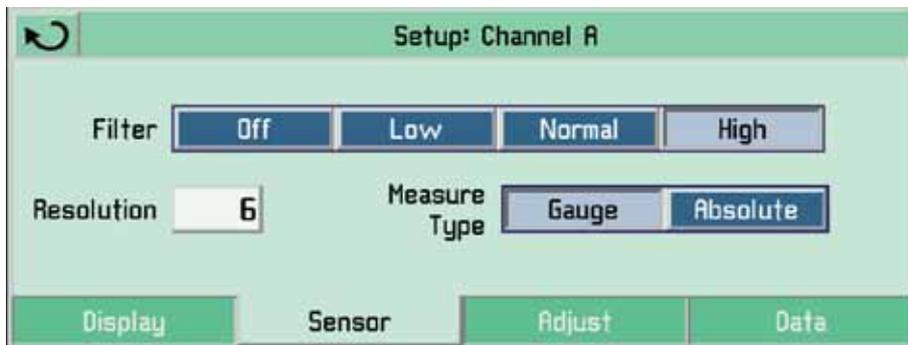
Digital Pressure Gauge SERIES CPG 2500

Barometer: If this optional feature was ordered with your CPG 2500, press Barometer to display the atmospheric pressure reading.

6.5.2.2 Sensor Tab

6.5.2.2.1 Standard Pressure Display Mode

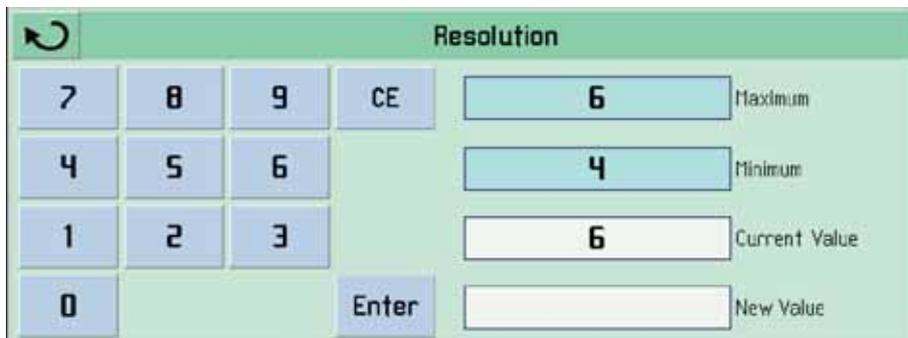
Press the sensor tab to select the pressure reading filter, the pressure measurement type and resolution.



Filter: The Filter is an electronic filter to smooth out the pressure readings. Because of differences in resolution, greater filtering may display a more stable reading for some pressure units. Select the best filter for the current units.

Measure Type: If the Instrument is equipped with the optional barometric reference sensor, the user can select Gauge or Absolute pressure emulation.

Resolution: The resolution key allows the user to select the number of significant digits that will be displayed on the main screen.



6.5.2.2.2 Delta Pressure Display Mode

This feature is available for a CPG 2500 when equipped with two primary sensors.

Delta Function: The delta function is selected from the Main Screen View (see Section 6.4.3).



To setup the delta function press the channel setup key from the delta channel displayed. The delta setup screen will appear.

6.5.2.2.2.1 Display Tab (Delta)

The adjust and measure functions can be selected from this screen.



Digital Pressure Gauge SERIES CPG 2500

6.5.2.2.2 Sensor Tab (Delta)

The delta function can be selected for a displayed channel, along with a different resolution.



6.5.2.2.3 Adjust Tab (Delta)

The adjust tab has no function in delta setup.



6.5.2.2.4 Data Tab (Delta)

The data tab resets the selected channel to default settings.



6.5.2.3 Adjust Tab

This tab is for adjusting zero and head pressure correction and setting access to those features. These features can be locked out by pressing the key icon. A password screen will appear. Enter the correct password. Next select the utility tab. The padlocks can then be toggled on or off.



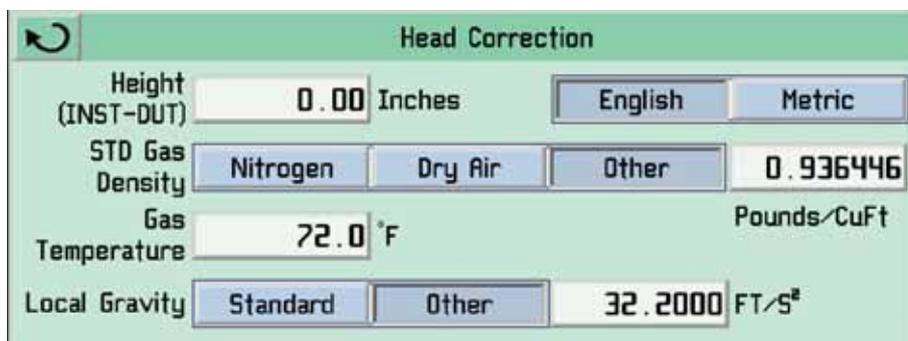
6.5.2.3.1 Zero

Zero can be adjusted on this tab and the main screen view (if selected) when the padlock icon is unlocked. Press the Zero key to enter a zero pressure offset.

6.5.2.3.2 Head Correction

Head correction can be adjusted on this tab when the padlock icon is unlocked. Press the Head Correction key to modify the head pressure correction settings.

Four parameters may be set to reflect conditions at the operator's site. Press either English or Metric units for entering head pressure correction information into the CPG 2500. Press the Head Correction key and the following screen will appear:



Digital Pressure Gauge SERIES CPG 2500



Notice

Head correction parameters are stored separately for each channel.

Height: Enter the difference in height between the center of the measure/control port of the CPG 2500 and the reference level of the Device Under Test (DUT). If the reference level of the DUT is lower than the center of the measure/control port of the CPG 2500, enter a positive height. If it is higher, enter a negative height.

Gas Density: If nitrogen (N₂) or dry air are being used as a pressure media, press the appropriate selection. If another gas is being used, enter the density for the gas at standard pressure and temperature in either lb/cubic foot (english) or kg/liter (metric) units.

Gas Temperature: Enter the average gas temperature in degrees F or C. If unsure of the gas temperature use 68 F.

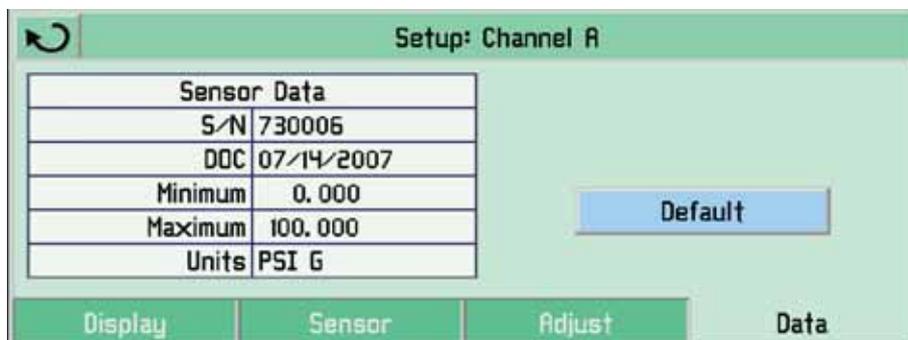
Local Gravity: Enter the local gravity acceleration value. If unsure, press the Standard gravity key.

Limits:

Height	±1200 inches
Density	0 to 1 lb/cu ft
Temperature	0 to 120 °F
Gravity	32 to 32.4 ft/sec ²

6.5.2.4 Data Tab

Press the data tab to display the sensor data.



Digital Pressure Gauge SERIES CPG 2500

Sensor information is displayed showing the serial number, date of calibration, minimum and maximum range, and the pressure units. If the Analog option is installed, the maximum and minimum values will be displayed.

Press the Default key to reset the instrument to the following conditions:

- Clear peak maximum and peak minimum values
- Set sensor filter to Normal
- Set resolution to six significant figures.

6.5.3 Pressure Units Key



Above the pressure reading window on the channel frame is the Units key. Touch the key to select from tables of English, Metric and User Defined Units. The current unit is shown selected. Touch any other pressure unit key to select that unit. Press the back key to return to the main screen. All the displayed pressure values for the channel will change to the newly selected unit.

6.5.3.1 English Tab

Units					
PSI	PSF	OSI	TSI	TSF	ATM
inHg 0°C	inHg 60°F	mTorr	Torr	inSW	ftSW
inH ₂ O 4°C	inH ₂ O 20°C	inH ₂ O 60°F			
ftH ₂ O 4°C	ftH ₂ O 20°C	ftH ₂ O 60°F			
English		Metric		User Units	

Digital Pressure Gauge SERIES CPG 2500

6.5.3.2 Metric Tab



6.5.3.3 User Units Tab

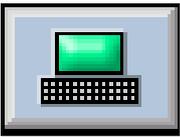
To enter customized user units, press the User Units tab. Choose PSI or pascal as a base unit and then enter a scaling factor by pressing the number key. Select from these two units by pressing User 1 or User 2.



7. Remote Operation

Use the following screens to set the operating parameters for Instrument emulation, Ethernet, Serial (RS-232) and IEEE-488 (GPIB) information.

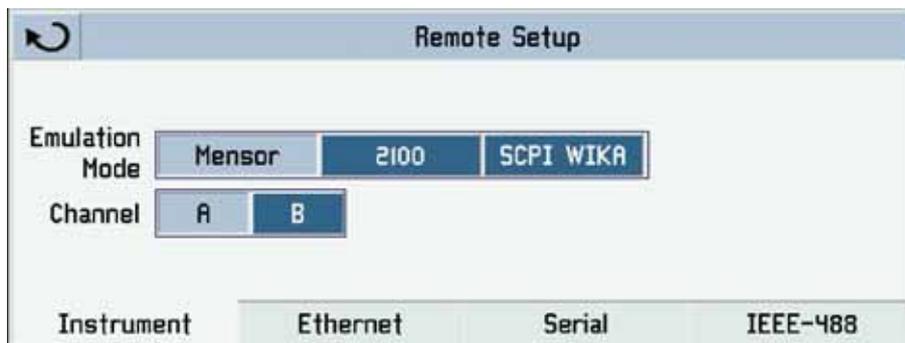
7.1 Remote Setup



Press the Remote Setup key (computer icon) on the toolbar to configure remote communication parameters for the CPG 2500.

7.1.1 Instrument Tab

Press the Instrument tab to set the remote communication emulation mode and for channel selection.



7.1.1.1 Emulation Mode

Mensor: The default command set is Mensor.

2100: The DPG 2100 remote emulation commands and queries information are listed under the heading 'Remote Emulation' in this section.

SCPI WIKA: The SCPI WIKA mode emulates the WIKA command set in SCPI format.

7.1.1.2 Channel

Press this key to select the active remote channel as A or B. This feature is useful for customers replacing two single channel instruments with a dual channel CPG 2500. The user selects the channel to be active during remote communications.

Digital Pressure Gauge SERIES CPG 2500

7.1.2 Ethernet Tab

Press the Ethernet tab to set up the Ethernet parameters.

Remote Setup			
IP	192.168.2.43	Port	49405
Netmask	255.255.255.0		
Gateway	192.168.2.6		
Instrument	Ethernet	Serial	IEEE-488



Caution

CAUTION: Please contact your network administrator for proper settings.



Caution

CAUTION: Please consult your computer resources department prior to connecting this instrument to your network to verify there are no conflicts with existing IP addresses.

The Ethernet communication port allows the CPG 2500 to communicate with computers using 10/100Based-T specifications.

Connecting directly to a PC requires a crossover Ethernet cable. Hub or router connection requires a straight Ethernet cable.

Before using Ethernet communication, four parameters must be set up: IP, Netmask, Gateway, and Port.

7.1.3 Serial Tab

Press this tab to set up the serial port parameters. The serial communication port allows the CPG 2500 to communicate in RS-232 format with computers, terminals, PDAs, or similar hosts.



These parameters should be set to match your host computer. Default settings are: 57600 baud, 8 data bits, 1 stop bit, no parity, and no echo.

If the echo checkbox is checked, the CPG 2500 will immediately echo back characters sent over the serial port.

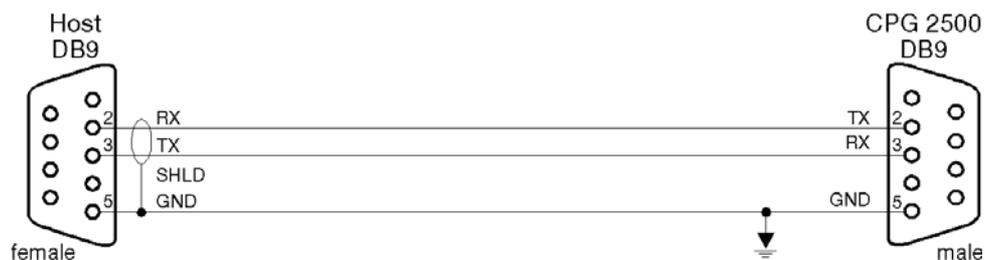
7.1.3.1 Cable Requirements

RS-232 communications are transmitted over a three conductor, shielded cable terminated in a standard DB9 connector on the instrument end, and a different gender connector on the host end. The proper pin-outs are shown in the following illustration.



Caution

CAUTION: When replacing an existing DPG 2100, the serial cable should be replaced with a straight cable or a null-modem inserted in the line.



Digital Pressure Gauge SERIES CPG 2500

7.1.3.2 Command and Query Format

Commands must be sent in ASCII format and terminated with either a carriage return (<cr>), linefeed (<lf>), or both. Commands are not case sensitive. Each query returns a response. If an error is detected the response will include an error flag.

Command or Query field: Unless otherwise specified, commands are typically converted to queries by appending a question mark to the command. Table 7.1.3.5 lists all of the CPG 2500 command or query keywords.

Data field: The data field is either in ASCII {string} or numeric {value} form. In the case of multiple data fields, commas are required to separate the fields. Queries do not have a data field. String (text) or value (numeric) data are acceptable in any of the following formats:

Examples of {string} data: ON, OFF, mBar, inHg

Examples of {value} data: 1, 1.0, -5.678, 25.68324e-5

7.1.3.3 Command Set Definitions

In this manual a data entry made up of alpha characters is defined as a string, as opposed to data containing only numbers, such as “Enter 1 for ON or 0 for OFF” where 1 and 0 are defined as values.

Command: Any command or query listed in Table 7.1.3.5. For commands that take boolean data the following strings are acceptable:

0	1
False	True
No	Yes
Off	On

Separator: Space (SP).

Data: ASCII representations of numbers, {value}, or alpha characters, {string}, data as defined above. When sending code a literal variable replaces the brackets and the enclosed character(s) shown in the following examples.

Termination: Linefeed (LF) or carriage return (CR) is used to signal the end of a command statement. For IEEE-488.2 operation “EOI” is an acceptable alternative.

Always send commands in one of the following formats:

1. [Command] [Termination];
2. [Command] [Separator] [Data] [Termination];

3. Queries are special instructions in the form: [Command?] [Termination] where the question mark, “?”, immediately precedes the terminator.

When a valid query is received, the CPG 2500 will return {data} terminated by CR and LF. Floating point data is returned in the current engineering units in exponential format.

7.1.3.4 Output Formats

Pressure readings are returned in exponential notation in a format according to the OUTFORM command as follows. Outform applies to both pressure channels.

1. <sp> pressure value <cr><lf>
2. <sp> pressure, units number,STANDBY <cr><lf>
3. <sp> pressure, pressure rate <cr><lf>
4. <sp> pressure, minimum peak, maximum peak <cr><lf>

7.1.3.5 Commands and Queries

Table 7.1.3.5 lists all of the current CPG 2500 commands and queries.



Notice

**Channel specific commands are sent to only the active channel.
See ‘CHAN’ command.**

Optional emulation modes are available in which a CPG 2500 can emulate remote functions of different brands of pressure gauges. Please contact Mensor for more details.

Table 7.1.3.5 - CPG 2500 Commands and Queries

Command or Query	Data	Response/Function
?	none	Returns data per the current output form.
ACQUIRE?	15 char string. Example: Acquire? Test_stand_1 Returns: <sp>(yes or no),CCC... CCC<cr><lf>	This command is used when multiple computers would like to control the instrument. Yes if acquisition is successful. No if instrument is being controlled with another computer. CCC... = name of controlling computer. See: RELEASE? and UNLOCK
ADDRESS	0-31	Sets the GPIB Address
ADDRESS?	<sp> xx <cr><lf>	Returns the GPIB Address.

Digital Pressure Gauge SERIES CPG 2500

A?	<sp>n.nnnnne+nn<cr><lf>	Returns the A channel pressure reading.
AR?	<sp>n.nnnnne+nn<cr><lf>	Returns the A channel rate.
BARO?	<sp>n.nnnnne+nn<cr><lf>	Returns reading from barometric sensor
B?	<sp>n.nnnnne+nn<cr><lf>	Returns the B channel pressure reading.
BR?	<sp>n.nnnnne+nn<cr><lf>	Returns the B channel rate.
CALDISABLE	yes,no	Sets whether or not calibration of the active channel is disabled.
CALDISABLE?	<sp>(yes or no)<cr><lf>	Returns whether or not calibration of the active channel is disabled.
CERR	none	Clears the error queue.
CHAN	A or B	Sets the active channel on the instrument.
CHAN?	<sp>A or B or D or Baro<cr><lf>	Returns which channel is active.
CHAN D	none	Sets the active channel to the Delta channel.
CHANFUNC	Press, peak, rate, baro	Sets the alternate function mode of the active channel.
CHANFUNC?	<sp>CCCC...<cr><lf>	Returns the alternate function mode of the channel.
DECPT?	<sp>n<c><lf>	Returns the number of decimal points for the active channel (see RESOLUTION).
DEFAULT	none	Sets the default values.
DELTAFUNC A-B	none	Sets the delta to be the result of the channel A reading - channel B reading. (Chan D must be in the active channel).
DELTAFUNC B-A	none	Sets the delta to be the result of the channel B reading - channel A reading. (Chan D must be in the active channel).
DELTAFUNC A+B	none	Sets the delta to be the result of the channel A reading + channel B reading. (Chan D must be in the active channel).
DELTAFUNC?	<sp>{A-B or B-A}<cr><lf>	Returns delta function as one of the above options. (Chan D must be in the active channel).

Digital Pressure Gauge SERIES CPG 2500

DOC	mm/dd/yyyy	Sets the date of cal for the active channel.
DOC?	<sp>mmddy<cr><lf>	Returns the date of cal for the active channel.
DOM?	<sp>mm/dd/yyyy<cr><lf>	Returns the date of manufacture.
FILTER	Off, Low, Normal, High	Sets the reading filter 0, 80%, 92%, 95%.
FILTER?	<sp> (filter)<cr><lf>	Returns the reading filter.
GASDENSITY	Value in lb/cuft	Sets the head pressure gas density.
GASDENSITY?	<sp>n.nnnnne+nn<cr><lf>	Gets the head pressure gas density.
GASTEMP	Value in degrees F	Sets the head pressure gas temperature.
GASTEMP?	<sp>n.nnnnne+nn<cr><lf>	Gets the head pressure gas temperature.
GATEWAY	nnn.nnn.nnn.nnn	Sets the Ethernet gateway address.
GATEWAY?	<sp>nnn.nnn.nnn.nnn <cr><lf>	Gets the Ethernet gateway address.
HEIGHT	Value in inches	Sets the head pressure height.
HEIGHT?	<sp>n.nnnnne+nn<cr><lf>	Gets the head pressure height.
ID?	<sp> MENSOR, 2500, ssssss,v.v.vv	Ssssss is the serial number, v.v.vv is the CPG 2500 software version.
IP	nnn.nnn.nnn.nnn	Sets the IP address of the instrument.
IP?	<sp>nnn.nnn.nnn.nnn <cr><lf>	Returns the IP address of the instrument.
KEYLOCK	yes or no	Locks or unlocks keyboard.
KEYLOCK?	<sp>(yes or no)<cr><lf>	Returns yes or no.
LISTRANGE?	PRI,1, min,max	Returns the range of the installed sensor for the active channel.
LOCALGRAVITY	value in ft/s^2	Sets the local gravity in feet/sec^2.
LOCALGRAVITY?	<sp>n.nnnnne+nn<cr><lf>	Returns the local gravity in feet/sec^2.
NETMASK	nn.nnn.nnn.nnn	Sets the Ethernet network mask.
NETMASK?	<sp>nnn.nnn.nnn.nnn <cr><lf>	Gets the Ethernet network mask.
OUTFORM	1 to 4 - (see Table 7.1.3.6)	Sets the output format.
OUTFORM?	<sp>X<cr><lf>	Returns the output format (see 7.1.3.4).

Digital Pressure Gauge SERIES CPG 2500

PEAKMAX?	<sp>n.nnnnne+nn<cr><lf>	Returns the maximum pressure since peakreset was sent.
PEAKMIN?	<sp>n.nnnnne+nn<cr><lf>	Returns the minimum pressure since peakreset was sent.
PEAKRESET	none	Resets the peak values.
PORT	nnnnnn	Sets the Ethernet port of the instrument.
PORT?	<sp>nnnnn<cr><lf>	Returns the Ethernet port of the instrument.
PTYPE	Absolute, Gauge or Differential	Sets the instrument pressure type - only works if the optional barometric sensor is installed.
PTYPE?	<sp>CCCCC<cr><lf>	Returns "Absolute" or "Gauge" for the pressure type.
RANGEMAX?	<sp>XXXXXXXX<cr><lf>	Returns the maximum range of the active transducer in the current units.
RANGEMIN?	<sp>XXXXXXXX<cr><lf>	Returns the minimum range of the active transducer in the current units.
RATE?	<sp>XXXXXXXX<cr><lf>	Returns the rate reading of the instrument in current units/second.
RDECPT?	<sp>n<cr><lf>	Returns the number of rate decimal points for the active channel. (see RESOLUTION)
RELEASE?	15 char string Example: Release? Test_stand_1 Returns: <sp>(yes or no), CCC...CCC<cr><lf>	This command is used to release control of the instrument in a multiple computer environment. Yes if release is successful. No if instrument is being controlled with another computer. CCC... = name of controlling computer or AVAILABLE. See: ACQUIRE? and UNLOCK
RESOLUTION	n	Sets the number of significant digits. See DECPT?
RESOLUTION?	<sp>n<cr><lf>	Returns the number of significant digits. See DECPT?
RFILTER	value in %	Sets the % of the rate filter.
RFILTER?	<sp>n.nnnnne+nn<cr><lf>	Returns the rate filter.
RWINDOW	value in current units	Sets rate exponential filter window.

Digital Pressure Gauge SERIES CPG 2500

RWINDOW?	<sp>n.nnnnne+nn<cr><lf>	Returns rate exponential filter window.
SBAUD	9600, 19200, 38400, 57600	Sets the serial baud rate.
SBAUD?	<sp>XXXX<cr><lf>	Returns the serial baud data.
SCREENSRC	A, B, or A,B, or B,A, or Delta,A, or Delta,B	Sets the CPG 2500 display mode.
SCREENSRC?	<sp>{A,B or A,Delta or Delta,B}<cr><lf>	Returns screen source as one of the above options.
SDATA	7 or 8	Sets the serial data bits.
SDATA?	<sp>X<cr><lf>	Returns the serial data bits number.
SENSORID?	<sp>Mensor QRS,SN XXXXXX,VER V.VV	Returns the active sensor's serial number and firmware version.
SPAN	desired pressure or ?	Sets span on active channel or for ?, clears previous value, must be >50% FS and has a 1% limit.
SPAN?	<sp>XXXXXXXX<cr><lf>	Returns span scale factor for active channel.
SPARITY	even, odd, none	Sets the serial parity.
SPARITY?	<sp>CCCC<cr><lf>	Returns the serial parity.
SSTOP	1 or 2	Sets the serial stop bits.
SSTOP?	<sp>X<cr><lf>	Returns the serial stop bits.
UNITS	units code or text in Table 7.1.3.6.	Sets the engineering units for the active channel.
UNITS?	<sp>CCCC<cr><lf>	Returns the pressure units of the active channel in a text string.
UNLOCK	none	Releases Acquire locks. See ACQUIRE? and RELEASE?
WINDOW	value in current units	Sets the exponential filter window for the active channel.
WINDOW?	<sp>n.nnnnne+nn<cr><lf>	Returns the exponential filter window for the active channel.
ZERO	desired pressure or ?	Sets zero to set pressure or for ?, clears previous value.
ZERO?	<sp>xxxxxxx<cr><lf>	Returns zero offset for active channel.

Digital Pressure Gauge SERIES CPG 2500

7.1.3.6 Units Command Syntax for Measurement Units

Table 7.1.3.6 - UNITS Command Syntax for CPG 2500 Measurement Units

n	Description	Output Format	Type
1	pounds per square inch	PSI	English
2	inches of mercury @ 0°C	INHG	English
3	inches of mercury @ 60°F	INHG	English
4	inches of water @ 4°C	INH2O	English
5	inches of water @ 20°C	INH2O	English
6	inches of water @ 60°F	INH2O	English
7	feet of water @ 4°C	FTH2O	English
8	feet of water @ 20°C	FTH2O	English
9	feet of water @ 60°F	FTH2O	English
10	millitorr	MTORR	Metric
11	inches of sea water @ 0°C	INSW	English
12	feet of sea water @ 0°C	FTSW	English
13	atmospheres	ATM	English
14	bars	BAR	Metric
15	millibars	MBAR	Metric
16	millimeters of water @ 4°C	MMH2O	Metric
17	centimeters of water @ 4°C	CMH2O	Metric
18	meters of water @ 4°C	MH2O	Metric
19	millimeters of mercury @ 0°C	MMHG	Metric
20	centimeters of mercury @ 0°C	CMHG	Metric
21	torr	TORR	Metric
22	kilopascals	KPA	Metric
23	pascals	PA	Metric
24	dynes per square centimeter	DY/CM ²	Metric
25	grams per square centimeter	G/CM ²	Metric
26	kilograms per square centimeter	KG/CM ²	Metric
27	meters of sea water @ 0°C	MSW	Metric
28	ounce per square inch	OSI	English

Digital Pressure Gauge SERIES CPG 2500

29	pounds per square foot	PSF	English
30	tons per square foot	TSF	English
32	micron of mercury @ 0°C	mHG	Metric
33	tons per square inch	TSI	English
34	hectapascals	HPA	Metric
36	megapascals	MPA	Metric
37	millimeters of water @ 20°C	MMH2O	Metric
38	centimeters of water @ 20C	CMH2O	Metric
39	meters of water @ 20°C	MH2O	Metric

7.1.3.7 CPG 2500 Error Codes

Table 7.1.3.7 - CPG 2500 Error Codes

Code	Serial Poll Byte	Description	Error String Returned
E00	00h	No errors	NO ERRORS
E05	45h	Parameter error	EGPIB PARAMETER ERROR: String that was sent
E07	47h	Syntax error	EGPIB SYNTAX ERROR: String that was sent

Digital Pressure Gauge SERIES CPG 2500

7.1.3.8 Remote Emulation

The Mensor DPG 2100 is the previous generation instrument similar to the CPG 2500. There is some compatibility between the CPG 2500 and a DPG 2100 in that the CPG 2500 will respond to many of the remote instructions as if it were the older instrument. The DPG 2100 commands will operate only on the currently active control channel.

A B channel selection: This channel selection sets the active remote channel to A or B and is useful for customers using a CPG 2500 to replace two single channel instruments. The user can select the channel here first, then begin their normal program.

Table 7.1.3.8.1 is a list of the remote commands and queries which the CPG 2500 will recognize and respond to.

A space between elements in a command indicate a required delimiter. Use either a space, comma, or tab where such a delimiter is indicated. A full description of the syntax and use for each of these commands and queries are presented in the DPG 2100 manual.



Notice

All pressure values will be in the currently active pressure units unless otherwise stated.

7.1.3.8.1 DPG 2100 Emulated Commands and Queries

Table 7.1.3.8.1 - DPG 2100 Emulated Commands and Queries

Command or Query	Data	Response/Function
ACCURACY?	accuracy? lf	Returns the uncertainty specification of the active sensor. The instrument returns <value><text><cr><lf> .

Digital Pressure Gauge SERIES CPG 2500

ADDRESS	address sp <value>lf	<p>Sets the device IEEE-488 address just as the address key does in local operation. The address can be any number from 0 through 30. Single digit numbers can be preceded by a zero (01, etc.), but the zero is not required. The command is address sp <value><lf> where <value> is a number from 0 to 30.</p> <p>Note: Allow at least 0.1 second between an address change command and the next command to allow the system to complete the change.</p>
C		not emulated
DEFAULT	defaultlf	Returns the CPG 2500 default values set at the factory.
DIGITS	digits sp <value>lf	Sets the bus and display output resolution to either five digits (full scale converted between 5,000 to 50,000 parts) or six digits (full scale between 50,000 to 500,000 parts). Send digits sp <value>lf where <value> is 5 for five digits, or 6 for six digits of resolution.
DIGITS?	digits?lf	<p>The digits query returns the number of digits in the output resolution.</p> <p>Returns: <value><cr><lf> where <value> is either 5 or 6, same as above.</p>
DISPLAY	display sp<value>lf	<p>This command sets the display format. Returns value<cr><lf> where <value> is:</p> <ul style="list-style-type: none"> 0 normal 1 rate/second 2 rate/minute 3 hourly change 4 peak (min.) 5 peak (max.) 6 rate/3 hour 7 tare (see below): <p>Display 7 is a toggle switch. If DISPLAY 7 is sent to turn on the tare feature, DISPLAY 7 must be sent to disable it.</p>

Digital Pressure Gauge SERIES CPG 2500

DISPLAY?	display?lf	To determine the current display setting; Returns <value><cr><lf> where <value> is 0 to 7, same as above.
DOC	doc sp <mm/dd/yy>lf	This command allows the user to replace the date of calibration in memory each time the unit is re-calibrated. Before sending DOC the master password must be invoked. where: mm is a two digit value from 01 to 12 for the month, dd is a two digit value from 01 to 31 for the day, yy is a two digit value designating the current year. Note: There is no error checking associated with this command. This means that the system will accept entries which are obviously invalid. After entering and checking a new date of calibration use the SAVE command to save the data to non-volatile memory.
DOC?	doc?lf	Returns the last eight characters saved under the DOC command.
ECHO	echolf	Turns on or off the echo string of serial commands. Send echolf where <value> is 1 to turn on the echo, 0 to turn off the echo. Echo on is the factory default. The on or off state can be saved with the SAVE command.
ERROR?	error?lf	If there is an error, this query will return an error message from the CPG 2500.
FILTER	filter sp <value>lf	The filter command sets the percentage of exponential filtering applied to the pressure readings. Send filter sp <value> lf where <value> is a number from 0 to 99.99 (percent filtering).
FILTER?	FILTER?lf	This query returns the percentage of exponential filtering currently applied to the pressure reading. The instrument returns <value><cr><lf> where <value> is a value from 0 (no filtering) to 99.99 (max filter).
ID?	ID?lf	Returns ID string of the CPG 2500.

Digital Pressure Gauge SERIES CPG 2500

KEYLOCK	Keylock sp <value> lf	Invoking the KEYLOCK command makes the front panel keys inoperative. Where <value> is 1 to lock out the front panel keys, 0 to enable front panel key functions.
LINEREV		not emulated
MODEL?	model?lf	This query returns the CPG 2500 model number.
OPT?	opt?lf	Returns the type of any installed options for the CPG 2500.
OUTFORM	outform sp <value> lf	<p>The OUTFORM command sets a particular output format as shown below. This command affects only the remote return string; it has no effect on the front panel display.</p> <p>Where <value> is:</p> <ul style="list-style-type: none"> 0: Returns pressure, rate, or peak values in fixed decimal format, which is the default format. 1: Returns pressure and temperature data in counts for factory use. 2: Returns output pressure, pressure rate, or peak values. <p>Use the SAVE command to retain the latest OUTFORM configuration.</p>
RANGENEG?	rangeneg?lf	This query will return the lower range of the active channel.
RANGEPOS?	rangepos?lf	Returns the upper range of the active channel.
RFILTER	rfilter sp lf	Sets the percentage of exponential filtering applied to the pressure rate reading. Where <value> is a value from 0 to 99.99 (percent of FS).
RFILTER?	rfilter?lf	Returns the percentage of exponential filtering applied to the pressure rate reading.
RWINDOW	rwindow sp <value> lf	<p>Sets the pressure rate filter window.</p> <p>Where <value> is a value in the current units within the range of the instrument.</p>
RWINDOW?	rwindow?lf	The rwindow query returns the pressure rate filter window setting. The DPG returns <value><cr><lf> where <value> is a value in the current units within its range.

Digital Pressure Gauge SERIES CPG 2500

SAVE	SAVElf	Send a SAVE command to preserve changes made to variable parameters. Without the SAVE command recent changes will remain in effect only as long as the power is continuous, or until later changes displace them. If there is a power interruption (power OFF) before the SAVE command is issued, the next power up will return the instrument to its last saved settings.
SEA_LEVEL	SEA_LEVEL sp <value>lf SEA_LEVEL sp <text>lf	<p>[Baro]: This command is used to insert a local elevation correction for barometric pressure readings. The command must be preceded by either the PWSL or the PW password. If the adjustment command is sent before the required password, "SEA LEV CAL DISABLED" will appear briefly on the display and the adjustment value will not be accepted. The command value is in FEET if pressure units are English or a value in METERS if pressure units are Metric. The sea level correction may not be immediately reflected in the output. A SEA_LEVEL switch command allows the correction to be alternately applied to, or removed from the pressure reading.</p> <p>Send SEA_LEVEL sp <text> lf where <text> is: y to have the correction added to the output; n to remove the correction from the output, but still retain the latest value for future use.</p> <p>Use the SAVE command to save both the sea level value and the switch settings.</p>
SEA_LEVEL?	SEA_LEVEL? lf	[Baro]: Returns the current elevation correction. Returns: <value><text><cr><lf> where <value> is the sea level correction value and where <text> is FEET or METERS (units).

SPAN	SPAN sp <value> lf	Use the SPAN command to correct the pressure reading at FS. This command first requires the PW password to be issued. Send the true pressure value while maintaining at least 50% of the FS pressure on the pressure port. (Refer to the Maintenance and Calibration sections for details on calibrating an instrument.) Where <value> is true pressure value in current engineering units.
SPAN?	SPAN? lf	The SPAN query will return the span correction scale factor. Returns <value><cr><lf> where <value> is a multiplication factor from 0.90000 to 1.10000.
TARE	TARE sp <value> lf	TARE sets the tare offset in the current engineering units. Either the PWT or the PW password must be sent before the first occurrence of the TARE command. Where <value> is a value between +/- 7.0000 psi.
TARE?	TARE?lf	Returns the current tare calibration variable. Returns <value><cr><lf> where <value> is the current TARE offset in the current units.
TYPE?	type?lf	Returns the type of pressure sensor in the instrument: ABSOLUTE PRESSURE<cr><lf> for an absolute sensor, or: GAUGE PRESSURE<cr><lf> for a gauge pressure sensor.
UNITS	UNITS sp<value> lf	This command selects the engineering units to be output on the bus and the display for all subsequent pressure readings. Where <value> is a one or two digit units code number from the 'n' column of Table 7.1.3.6.
UNITS?	units?lf	This query returns the units code and the ASCII string for the units as <value><text><cr><lf> where <value> is: the units code from column "n" (see Table 7.1.3.6) and where <text> is the corresponding ascii string listed under 'Output Format.

Digital Pressure Gauge SERIES CPG 2500

UNITS_TABLE		not emulated
UNITS_TABLE?	UNITS_TABLE? If	not emulated
WINDOW	window sp <value>lf	Sets the filter window for pressure readings where <value> is a value in the current measurement units within the range of the instrument.
WINDOW?	window?lf	Returns the filter window setting for the pressure reading. The instrument returns <value><cr><lf> where <value> is a value in the current units within the range of the instrument.
ZERO	zero sp <value>lf	This command requires that the PWZ or the PW password must be issued before the first occurrence of the zero command. The zero command sets the DPG zero offset to <value> in the current units where <value> is a value between +/- 17 psi.
ZERO?	ZERO?lf	Returns the current zero calibration offset where <value> is current zero value in current measurement units.

7.1.3.8.2 UNITS Command Syntax for DPG 2100 Measurement Units

Table 7.1.3.8.2 - UNITS Command Syntax for DPG 2100 Measurement Units

N	Description	Output Format	Type
1	pounds per square inch	PSI	English
2	inches of mercury @ 0°C	INHG	English
3	inches of mercury @ 60°F	INHG	English
4	inches of water @ 4°C	INH2O	English
5	inches of water @ 20°C	INH2O	English
6	inches of water @ 60°F	INH2O	English
7	feet of water @ 4°C	FTH2O	English
8	feet of water @ 20°C	FTH2O	English

Digital Pressure Gauge SERIES CPG 2500

9	feet of water @ 60°F	FTH2O	English
10	millitorr	MTORR	Metric
11	inches of sea water @ 0°C	INSW	English
12	feet of sea water @ 0°C	FTSW	English
13	atmospheres	ATM	English
14	bars	BAR	Metric
15	millibars	MBAR	Metric
16	millimeters of water @ 4°C	MMH2O	Metric
17	centimeters of water @ 4°C	CMH2O	Metric
18	meters of water @ 4°C	MH2O	Metric
19	millimeters of mercury @ 0°C	MMHG	Metric
20	centimeters of mercury @ 0°C	CMHG	Metric
21	torr	TORR	Metric
22	kilopascals	KPA	Metric
23	pascals	PA	Metric
24	dynes per square centimeter	DY/CM ²	Metric
25	grams per square centimeter	G/CM ²	Metric
26	kilograms per square centimeter	KG/CM ²	Metric
27	meters of sea water @ 0°C	MSW	Metric
28	ounce per square inch	OSI	English
29	pounds per square foot	PSF	English
30	tons per square foot	TSF	English
32	micron of mercury @ 0°C	mHG	Metric
33	tons per square inch	TSI	English
34	hectapascals	HPA	Metric
36	megapascals	MPA	Metric
37	millimeters of water @ 20°C	MMH2O	Metric
38	centimeters of water @ 20°C	CMH2O	Metric
39	meters of water @ 20°C	MH2O	Metric

Digital Pressure Gauge SERIES CPG 2500

7.1.3.8.3 DPG II Models 14000/15000 Terse Message Set Emulation

The following device dependent messages include the original terms enabled for the DPGII. Most of these terms have an equivalent message in the above, expanded message list. When sending a terse message to the CPG 2500, transmit the message followed by an X. The X signals the CPG 2500 to execute the command contained in the message.

A Command (used with RATE option; same as RATE_WINDOW command):

The A command sets the pressure rate filter window from 0 to 9 percent of full scale. The command format is: AnX where n = 0 to 9

C Command (no equivalent expanded command): The C command is not emulated.

E Command (no equivalent expanded command): The E command is not emulated.

F Command (used with RATE option; same as RATE_FILTER command)

Q Command (similar to some expanded commands):

The Q command is a request for data from the CPG 2500. The output data will be formatted according to the specific form of the Q command. Output formats 0 and 1 will remain selected until changed by a subsequent Q command. Output formats 2 through 7 will be in effect for one output cycle only, after which the format will revert to 0 or 1, whichever was last being used.

The syntax for the Q command is QnX where n is a number (0 - 7) as described in the following table. The table also lists the resulting output format for each value of n.

space = an ASCII space character (32 dec)

<cr> = an ASCII carriage return (13 dec)

<lf> = an ASCII linefeed (10 dec)

EOI (End Of Instruction) is set with the <lf> (on the GPIB)



Notice

The Q1X command changes the output units to counts, and Q0X resets it to default units.

The 'Q' Command Data/Output Format

n	Description	Output Format
0	Pressure reading in the selected units. This is the default output format.	NNNNNNNN<cr><lf>where each N is a number (0 through 9), +,-,decimal point, or a space. If the pressure rate or peak monitor option is being used the output format is NNNNNNNN,NNNNNNNN<cr><lf>. The data before the comma is the pressure and the data after the comma is the pressure rate or peak.
1	Raw A/D readings (for factory use)	nnnnnnnn,nnnnnnnn<cr><lf> where each n is a number (0 through 9) or a space.
2	Unit ID	Unit ID for the CPG 2500
3	Pressure range and measurement units	NNNNNNNN,NNNNNNNN, @@@@<cr><lf> where each N is a number (0 through 9), decimal point, or a space and each @ is an alpha-numeric character. The output string represents the minimum pressure, maximum pressure and the pressure units.
4	Error status code	CPG 2500's error codes
5	Calibration data	not emulated
6	Pressure rate or peak indication	nnnn where each n is a number (0 through 9) valid only if optional pressure rate or peak is enabled. The meaning of each digit is shown under the related feature in the Options section of the DPG II manual.
7	Zero and span corrections	ZZZZZZZ,SSSSSSS<cr><lf> where ZZZZZZZ is the zero correction and SSSSSSS is the span correction.
8	Calibration coefficients	not emulated

S Command: same as SPAN command.

T Command: used with RATE option; similar to DISPLAY command.

Digital Pressure Gauge SERIES CPG 2500

U Command: same as UNITS command.

The U command selects the measurement units to be output on the bus and the display. The syntax for the U command is UnX where n is a number as described in the table below.

The 'U' Command Syntax for Measurement Units

n	Description	Output Format	Type
0	internal counts	COUNTS	raw data
1	pounds per square inch	PSI	English
2	inches of mercury @ 0°C	INHG	English
3	inches of mercury @ 60°F	INHG	English
4	inches of water @ 4°C	INH ₂ O	English
5	inches of water @ 20°C	INH ₂ O	English
6	inches of water @ 60°F	INH ₂ O	English
7	feet of water @ 4°C	FTH ₂ O	English
8	feet of water @ 20°C	FTH ₂ O	English
9	feet of water @ 60°F	FTH ₂ O	English
10	millitorr	MTORR	Metric
11	inches of sea water	INSW	English
12	feet of sea water	FTSW	English
13	atmospheres	ATM	English
14	bars	BAR	Metric
15	millibars	MBAR	Metric
16	millimeters of water @ 4°C	MMH ₂ O	Metric
17	centimeters of water @ 4°C	CMH ₂ O	Metric
18	meters of water @ 4°C	MH ₂ O	Metric
19	millimeters of mercury @ 0°C	MMHG	Metric
20	centimeters of mercury @ 0°C	CMHG	Metric
21	torr	TORR	Metric
22	kilopascals	KPA	Metric
23	pascals	PA	Metric
24	dynes per square centimeter	DY/CM ²	Metric

Digital Pressure Gauge SERIES CPG 2500

25	grams per square centimeter	G/CM ²	Metric
26	kilograms per square centimeter	KG/CM ²	Metric
27	meters of sea water	MSW	Metric
28	ounce per square inch	OSI	English
29	pounds per square foot	PSF	English
30	tons per square foot	TSF	English
31	percent of full scale	%FS	English
32	micron of mercury @ 0°C	mHG	Metric
33	tons per square inch	TSI	English
34	hectapascals	HPA	Metric

W Command: not emulated.

Z Command: same as ZERO command.

Digital Pressure Gauge SERIES CPG 2500

7.1.3.8.4 General SCPI WIKA Commands

STATus

:OPERation	
:CONDition?	Returns an integer value representing instrument status that can be decoded. Bit 0: Zeroing active. Bit 1: Control Setpoint has not been reached. Bit 2: Reserved 0. Bit 3: Reserved 0. Bit 4: Measuring. The instrument is actively measuring.

MEASure

[:PRESsure] [z]?	Returns the pressure in the current units from the specified sensor, or active sensor if [z] is omitted.
:TEMPerature[z]?	Returns the temperature in deg. C. from the specified sensor, or active sensor if [z] is omitted.
:RATE[z]?	Returns the pressure rate in the current units from the specified sensor, or active sensor if [z] is omitted.
:BAROmetric?	Returns the barometric pressure in the current unit, if a barometer sensor is installed.

CALibration

:MODE?	Returns 1 if the sensor has been calibrated or 0 if not.
:DATE?	Returns the stored calibration date.
:DATE <i,i,i>	Sets the calibration date (YYYY,MM,DD).
:ZERO?	Returns current zero point correction in bar.
:ZERO <n>	Sets the zero so the currently measured pressure matches the commanded value in the current unit. Limited to +/-5% FS.
ZERO:RUN	Vents the instrument and sets zero so the currently measured pressure = 0.

SENSE

[:PRESsure] [z]	Selects the sensor to read or modify or active sensor if [z] is omitted.
:NAME?	Returns the accuracy and range of the sensor.
:MODE?	Returns pressure type "ABSOLUTE" or "GAUGE"
:MODE ABS/GAUGE	Sets the pressure type to absolute or gauge.
:ABS?	Returns native sensor type "1" for absolute, "0" for gauge.
:RESolution?	Returns the FS-related relative resolution of the sensor.
:RANGE	
[:UPPer]?	Returns the maximum range of the primary sensor.
:LOWer?	Returns the minimum range of the primary sensor.
:Unit	
[:NAME]?	Returns a string representing the native units of the sensor.
:VALue?	Returns the conversion factor of the native units of the sensor to the current unit.
:REFerence	
[:HEIGHt] <n>	Sets the head height correction [mm].
:MODE?	Returns head correction mode - "OFF", "GAS", "LIQUIT".
:MODE OFF/GAS/LIQUIT	Sets the head correction mode.
:MEDIUM <n>	Sets the density of the medium at 20°C & 1bar(abs) [kg/m ³] (or equivalent value in current units).

SYSTem

:DATE <i,i,i>	Sets the system date (YYYY,MM,DD).
:TIME <i,i,i>	Sets the system time (hh,mm,ss).
:ERRor[:NEXT]?	Return: error#, "description".
:KLOCK ON/OFF/1/0	Lock or unlock keyboard.
:SAVE	Saves settings to non-volatile memory.
:VERSion?	Return of the SCPI-standard.

Digital Pressure Gauge SERIES CPG 2500

TEST

:ELECTronic?	Returns electronics status.
:RELay<n>?	Returns whether relay 1 to 3 is closed or not.
:RELay<n> ON/OFF	Turns relay 1 to 3 on or off.

UNIT

:NAME<n>?	Returns the name of the unit with index n.
:FACTOR<n>?	Returns the conversion factor to the current unit with index n.

:INDEX<n>?

index	unit
0	bar
1	mbar
2	Pa
3	psi
4	atm
5	kp/cm2
6	lbf/ft2
7	kPa
8	cmH2O(4°C)
9	inH2O(4°C)
10	inH2O(20°C)
11	inH2O(60°F)
12	ftH2O(4°C)
13	mmHg(0°C)
14	cmHg(0°C)
15	inHg(0°C)
16	inHg(60°F)
17	--
18	--
19	--
20	--

7.1.3.8.4.1 Error Messages and Error Codes

Recognized command: displayed at the device in the headline with “Remote...”. In case of error “Remote error...” is displayed. Maximum of 100 errors are stored and can be retrieved successfully.

7.1.4 IEEE-488 Tab (Option)

Press the Remote Setup key and the remote setup screen will appear with an IEEE-488 tab on the bottom. Press the IEEE-488 tab and the following screen will appear.



This screen is for setting the IEEE-488 address. Touch the numeric value box and a number entry keypad will appear for you to enter your new IEEE-488 address and then press [OK].

The manufacturer of the host IEEE-488 interface board provides software to allow communication between the board and various programming languages. An interactive program for debugging is usually provided as well. Refer to the board manufacturer's documentation for more information.

7.1.4.1 GPIB Capability Codes

- SH1 Full source handshake capability
- AH1 Full acceptor handshake capability
- T6 Talker with serial poll and unaddress if MLA
- L4 Listener with unaddress if MTA
- SR1 Full service request capability
- L1 Full remote/local capability including LLO
- PO No parallel poll capability
- DC1 Full device clear capability
- DT1 Full device trigger capability
- C0 No controller capability
- E2 Tri-state outputs

Digital Pressure Gauge SERIES CPG 2500

7.1.4.2 Interface Functions

The CPG 2500 responds to the following IEEE.488.2 interface functions:

- SRQ** Service Request: A service request is asserted whenever an error is encountered. When the bus controller issues a serial poll the error will be cleared. If the host IEEE board includes automatic serial polling capability, turn this feature off in order to view all errors.
- LLO** Local Lockout: The front panel keyboard of the CPG 2500 may be locked by sending LLO or the command KEYLOCK ON.
- GET** Group Execute Trigger: When this message is received, the CPG 2500 will save the current readings until the next time it is addressed as a talker.
- GTL** Go To Local: A GTL message will cause the CPG 2500 to return to local operation and unlock the keyboard.
- DCL** Device Clear: When this message is received, the CPG 2500 will clear all errors and buffers and remain in the Remote mode.
- SDC** Selected Device Clear: The effect is the same as DCL.
- EOI** End or Identify: May be used as a command or query terminator in the place of, or concurrent with, a terminating linefeed.

7.1.4.3 IEEE-488.2 Commands

Command or Query	Response / Function
*IDN?	Returns identification string
*RST	Reset to known state (default+psi)
*TST?	Returns 1
*OPC	Operation completed
*WAI	Returns operation completed state
*CLS	Clear status and error queue
*ESE	Enable status event
*ESE?	Returns enable status even value
*ESR	Event status register
*ESR?	Returns even status register value
*SRE	Service request enable
*SRE?	Returns service request enable value
*STB?	Returns status byte

8. Options

- Barometric Reference Transducer
- Barometer
- Analog Output
- IEEE-488 (see “7.1.4 - IEEE-488” in Section 7, Remote Operation)
- Rack Mount Kit (optional accessory)

8.1 Barometric Reference Transducer

The Barometric Reference Transducer is a very stable, absolute pressure sensor used to accurately measure local atmospheric pressure.

The CPG 2500 uses the barometric pressure measured by the installed barometric reference sensor in both channels and allows pressure type emulation on both channels.

8.1.1 Gauge Pressure Emulation

On absolute units set the CPG 2500 for gauge pressure measurement by touching the Channel Setup key, then the sensor tab, press [gauge], and then touch the back key. The operation screen now shows units ‘GE’ in place of units ‘A’. The “GE” indicates that the measurement and control values are in gauge emulation pressure units.

In the gauge emulation mode the atmospheric pressure reading from the barometric reference transducer is subtracted from the absolute pressure reading of the active channel to emulate a gauge pressure.

The barometric reference sensor has six significant digits. If a very low pressure gauge sensor is active and is used in absolute emulation, the combined output may appear quite noisy because of the resolution of the barometric reference.

Emulation mode uncertainty is the combined uncertainty of the barometric reference transducer and the active transducer.

8.1.2 Absolute Pressure Emulation

On gauge units set the CPG 2500 for absolute pressure measurement by touching the Channel Setup key, then the sensor tab, press [absolute], and then touch the back key. The operation screen now shows units ‘AE’ in place of units ‘G’. The “AE” indicates that the measurement and control values are in absolute emulation pressure units.

Digital Pressure Gauge SERIES CPG 2500

In absolute emulation mode the atmospheric pressure reading from the barometric reference transducer is added to the gauge pressure reading of the active channel to emulate absolute pressure.

8.1.3 Calibration

The Barometric Reference Transducer can be calibrated in exactly the same manner as the other installed sensors as described in Section 10, Calibration.

8.1.4 Specifications

Accuracy: 0.01% of reading. Uncertainties include all pressure effects, temperature effects over the calibrated range and calibration stability for six months after re-zeroing.

Pressure Range: The standard Barometric Reference Transducer is calibrated from 11 to 17 psia.

Resolution: 6 digits.

8.2 Barometer

The CPG 2500 can be ordered as a Barometer. It is a very stable, absolute pressure sensor used to accurately measure local atmospheric pressure. The channel setup information as explained in this manual also applies to the Barometer. The only difference will be the adjust tab setup for zero and sea level adjustment.

8.2.1 Zero and Sea Level Adjustment

Zero: Zero can be adjusted on this tab and the main screen view (if selected) when the padlock icon is unlocked. Press the Zero key to enter a zero pressure offset.

Sea Level: Sea level correction can be adjusted on this tab and the main screen view (if selected) when the padlock icon is unlocked. Press the sea level key to modify the sea level correction settings.

The elevation offset pressure will always be positive unless the Barometer is below sea level. The following table shows the calculated pressure values at various elevations.

Digital Pressure Gauge SERIES CPG 2500

Table 8.2.1 - Standard Sea Level Pressure at Various Elevations*

ELEVATION		PRESSURE UNITS		
FEET	METERS	PSI	INHG 0C	MMHG 0C
-3000	-914.40	16.36067	33.31075	846.09349
-2500	-762.00	16.07310	32.72524	831.22156
-2000	-609.60	15.78963	32.14809	816.56201
-1500	-457.20	15.51023	31.57922	802.11253
-1000	-304.80	15.23484	31.01852	787.87078
-900	-274.32	15.18024	30.90735	785.04716
-800	-243.84	15.12580	30.79651	782.23174
-700	-213.36	15.07151	30.68599	779.42450
-600	-182.88	15.01739	30.57579	776.62542
-500	-152.40	14.96342	30.46591	773.83449
-400	-121.92	14.90961	30.35635	771.05169
-300	-91.44	14.85596	30.24711	768.27699
-200	-60.96	14.80246	30.13819	765.51039
-100	-30.48	14.74912	30.02958	762.75185
0	0	14.69594	29.92130	760.00138
100	30.48	14.64291	29.81333	757.25894
200	60.96	14.59003	29.70567	754.52451
300	91.44	14.53731	29.59833	751.79809
400	121.92	14.48475	29.49131	749.07965
500	152.40	14.43233	29.38460	746.36918
600	182.88	14.38008	29.27820	743.66666
700	213.36	14.32797	29.17211	740.97206
800	243.84	14.27602	29.06634	738.28537
900	274.32	14.22422	28.96087	735.60658
1000	304.80	14.17257	28.85572	732.93567
2000	609.60	13.66441	27.82108	706.65580
3000	914.40	13.17110	26.81669	681.14420
4000	1219.20	12.69231	25.84186	656.38356
5000	1524.00	12.22771	24.89593	632.35686
6000	1828.80	11.77698	23.97823	609.04734
7000	2133.60	11.33980	23.08812	586.43850
8000	2438.40	10.91585	22.22495	564.51410

Digital Pressure Gauge SERIES CPG 2500

9000	2743.20	10.50483	21.38811	543.25820
10000	3048.00	10.10644	20.57696	522.65508
15000	4572.00	8.29351	16.88579	428.89932
20000	6096.00	6.75340	13.75009	349.25242
25000	7620.00	5.45352	11.10351	282.02934
30000	9144.00	4.36410	8.88542	225.68990

*Standard sea level pressure: 0 feet = 29.92126 inches HgA (0 meters = 1013.25 mbar).

8.2.2 Calibration

The Barometer can be calibrated in exactly the same manner as the other installed sensors as described in Section 10, Calibration.

8.2.3 Specifications

Accuracy: 0.01% of reading. Uncertainties include all pressure effects, temperature effects over the calibrated range and calibration stability for six months after re-zeroing.

Pressure Range: The Barometer is calibrated from 11 to 17 psia.

Resolution: 6 digits.

8.3 Analog Output

The CPG 2500 can be configured at the time of manufacture to have voltage output that is directly proportional to the full scale pressure range of the A and/or B channel pressure transducer(s) in the instrument. This output is available from a 4-position removable connection on the rear panel.



Connector pinouts - Analog Option

Pin 1	Channel B Signal +
Pin 2	Channel B Signal -
Pin 3	Channel A Signal -
Pin 4	Channel A Signal +

The analog signal is set at the factory to one of the following ranges:

-1 to +1 vdc	0 to +1 vdc
0 to +5 vdc	0 to +10 vdc

The formula to derive the measured pressure from the output voltage is:

$$\frac{\text{voltage span}}{\text{pressure span}} \times \text{measured pressure} + \text{voltage minimum}$$

The following example shows output voltages for two pressure values using a 0 to 250 psia full scale transducer with a 10 VDC analog signal:

Analog Output	True Pressure
0.5868 volts	14.67 psia
5.0000 volts	125.000 psia

Digital Pressure Gauge SERIES CPG 2500

8.3.1 Command Set for Analog Output Option

Commands can be used over any of the communications ports available.

Table 8.3.1 - Command Set for Analog Output

Command or Query	Data	Response/Function
Analogdoc	mmddy	Sets date of cal for the analog output
Analogdoc?	<sp>mmddy<cr><lf>	Returns date of cal for the analog output.
Analogsn?	38 char string is returned	Returns analog board type, serial number and version.
Analogspan	numeric value<cr><lf>	Sets analog span, value ranges between .9996 and 1.0004.
Analogspan?	<sp>value<cr><lf>	Returns analog span adjust value.
Analogvmin?	<sp>value<cr><lf>	Returns analog output minimum voltage range.
Analogvmax?	<sp>value<cr><lf>	Returns analog output maximum voltage range.
Analogzero	numeric value<cr><lf>	Sets analog zero, value ranges between -0.0004 to +0.0004.
Analogzero?	<sp>value<cr><lf>	Returns analog zero adjust value.
Analogsave	no parameter req'd	Saves all parameters changed by above commands.

8.3.2 Zero and Span Adjustment

1. Determine the current analog output correction factors:
Send: Analogzero? and Analogspan?
Record these factors for comparison of performance between calibrations.
2. Clear the current correction factors:
Send: Analogzero 0 and Analogspan 1

3. Connect a DMM to the analog output connector on the rear panel of the instrument. Apply a known true pressure at or near zero and take a reading with the DMM. Calculate the equivalent analog output voltage for the applied pressure using the formula:

$$\frac{\text{voltage span}}{\text{pressure span}} \times \text{measured pressure} + \text{voltage minimum}$$

Subtract this value from the DMM reading. Send the resulting offset value to the transducer with the Analogzero command.

4. Apply a known true pressure at or near the full scale pressure of the transducer. Take a reading with the DMM. Calculate the equivalent analog output voltage for the applied pressure using the formula:

$$\frac{\text{voltage span}}{\text{pressure span}} \times \text{measured pressure} + \text{voltage minimum}$$

Divide the calculated value by the reading of the DMM. The resulting value is the span correction factor and should be loaded into the transducer using the Analogspan command.

5. Send a Analogsave command to the transducer to move the correction factors to non-volatile memory.
6. The analog output can also be calibrated using a local user interface. Press the channel setup key, the adjust tab, and then the calibration functions key. A password screen will appear. Enter the correct password. The calibrate screen will appear. Press the sensor tab and then press the appropriate analog button. The analog calibration screen will appear. Zero and span can now be adjusted using the + and - buttons. The voltage will actively change as the adjust buttons are pressed.

8.3.3 Specifications

Resolution:	0-1 VDC	1 part per 80,000 minimum
	0-5 VDC	1 part per 400,000 minimum
	0-10 VDC	1 part per 800,000 minimum

Update Rate: 150mS

Digital Pressure Gauge SERIES CPG 2500

Uncertainties: 0-1 VDC	0.010% FS
0-5 VDC	0.010% FS
0-10 VDC	0.010% FS

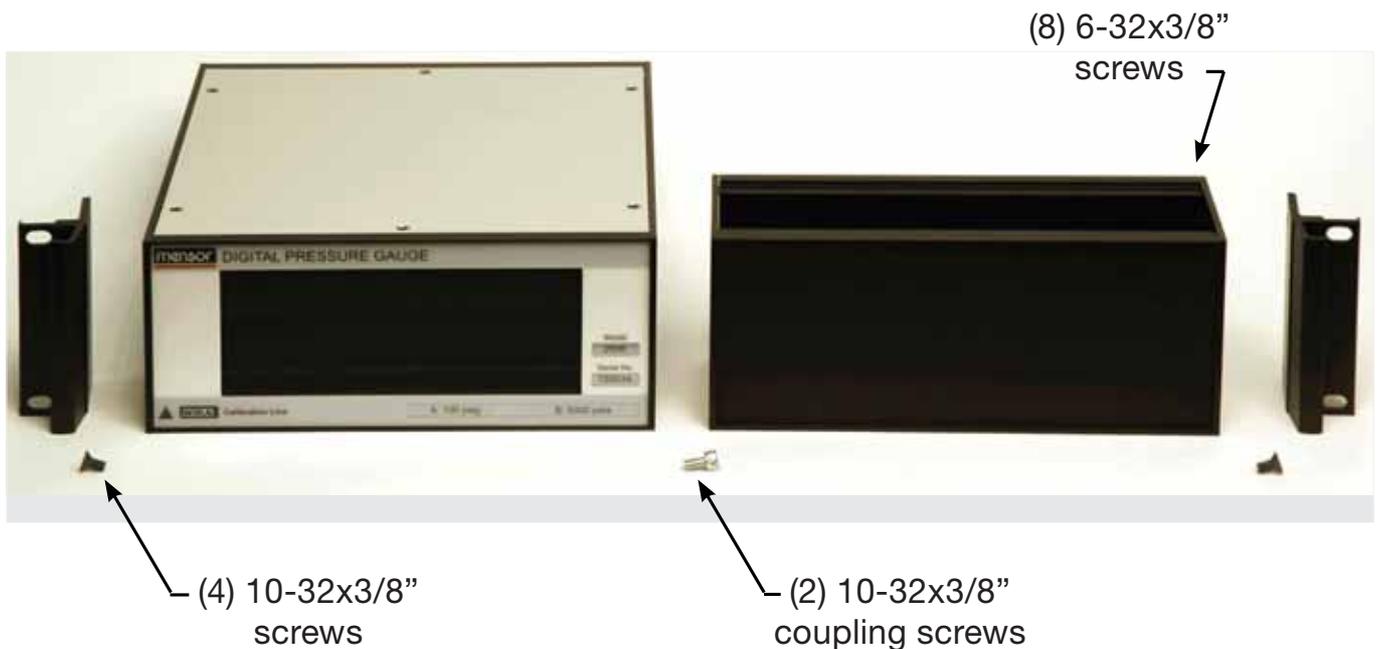
Minimum input impedance of the device measuring the analog output is 1 Megaohm.

8.4 IEEE-488 (GPIB)

The information for this option has been provided in Section 7, Remote Operation.

8.5 Rack Mount Kit (optional accessory)

A rack mount kit allows the customer to install a CPG 2500 into a standard 19" instrument rack. It includes rack mount angles as well as rack mount adapter panels and hardware to mount the instrument.



9. Maintenance

The CPG 2500 was designed for maintenance-free operation. User maintenance is not recommended beyond replacement of parts listed in Table 9.2. If you have questions not covered by this manual, call 1.800.984.4200 (USA only), or 1.512.396.4200 for assistance, or send an e-mail to tech.support@mentor.com.

9.1 Beyond the Warranty

Take advantage of Mensor's expert product care. Mensor Corporation provides complete maintenance and calibration services, available for a nominal fee. Our service staff is knowledgeable in the innermost details of all of our instruments. We maintain units that are in operation in many different industries and in a variety of applications, and by users with a wide range of requirements. Many of these instruments have been in service for over twenty years, and continue to produce excellent results. Returning your instrument to Mensor for service benefits you in several ways:

- Our extensive knowledge of the instrument assures you that it will receive expert care.
- In many cases we can economically upgrade an older instrument to the latest improvements.
- Servicing our own instruments which are used in "real world" applications keeps us informed as to the most frequent services required. We use this knowledge in our continuing effort to design better and more robust instruments.

Digital Pressure Gauge SERIES CPG 2500

9.2 Spare Parts

Table 9.2 lists the spare parts for the CPG 2500 that can be ordered from Mensor.

Table 9.2 Spare Parts List

Part Description	Part Number
Manual	0017851001
Fuse	Littelfuse® 0454 002
Power Supply	4901000029
Fitting adapter 7/16-20 to 1/8 FNPT	6000602015
Fitting adapter 7/16-20 to 1/4 FNPT	0012688001
O-ring seals for 7/16-20 fitting	4250010020
Kit - Rack Mount adapter, single unit	0017839001

9.3 Replacing the Fuse

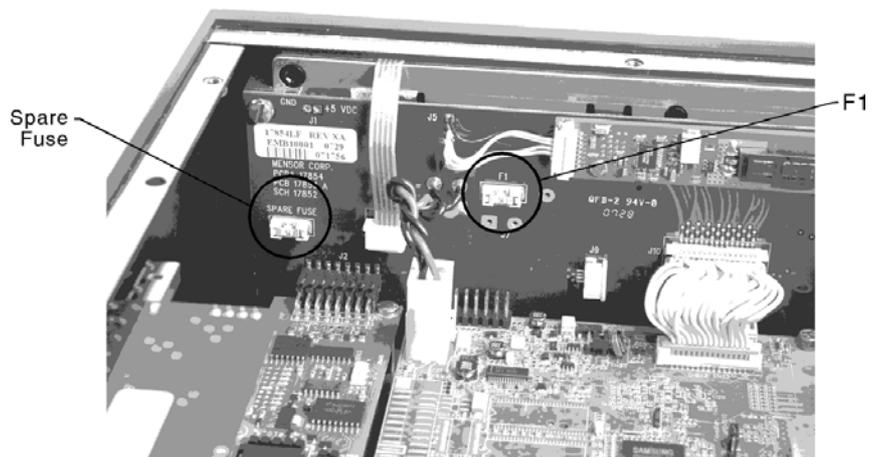
A spare fuse has been provided and is located on the circuit board as shown below.



Caution

In the event the fuse requires replacement, power down the instrument before proceeding!

1. Power off the instrument.
2. Remove the instrument cover and locate the circuit board.
3. Remove the spare fuse. Replace the fuse of F1 with the spare.
4. If the instrument blows the replacement fuse, please return the instrument for service.



10. Calibration

The CPG 2500 automatically adjusts the pressure reading for the effects of temperature and non-linearity within the calibrated temperature range of 15-45°C. The process is referred to as dynamic compensation because each reading is so adjusted before it is output to the display or to a communication bus. Thus, a calibrated CPG 2500 operated within its temperature band, and with proper zero and span adjustments, will provide accurate pressure measurements.

The CPG 2500 should have the calibration verified periodically to insure stability. The recommended calibration cycle is six months.

10.1 Environment

For maximum accuracy, allow the CPG 2500 to warm up a minimum of 15 minutes in ambient temperature within the compensated range prior to a calibration. In addition the instrument should be at rest on a stable platform that is free of excessive vibration and shock.

10.2 Pressure Standards

Mensor recommends the use of appropriately accurate primary pressure standards when calibrating this instrument. Such standards should be sufficient so that when the techniques of the ISO Guide to the Expression of Uncertainty in Measurement (GUM) are applied, the instrument meets its accuracy statements as required by ISO/IEC 17025:2005, or other applicable standards.

10.3 Media

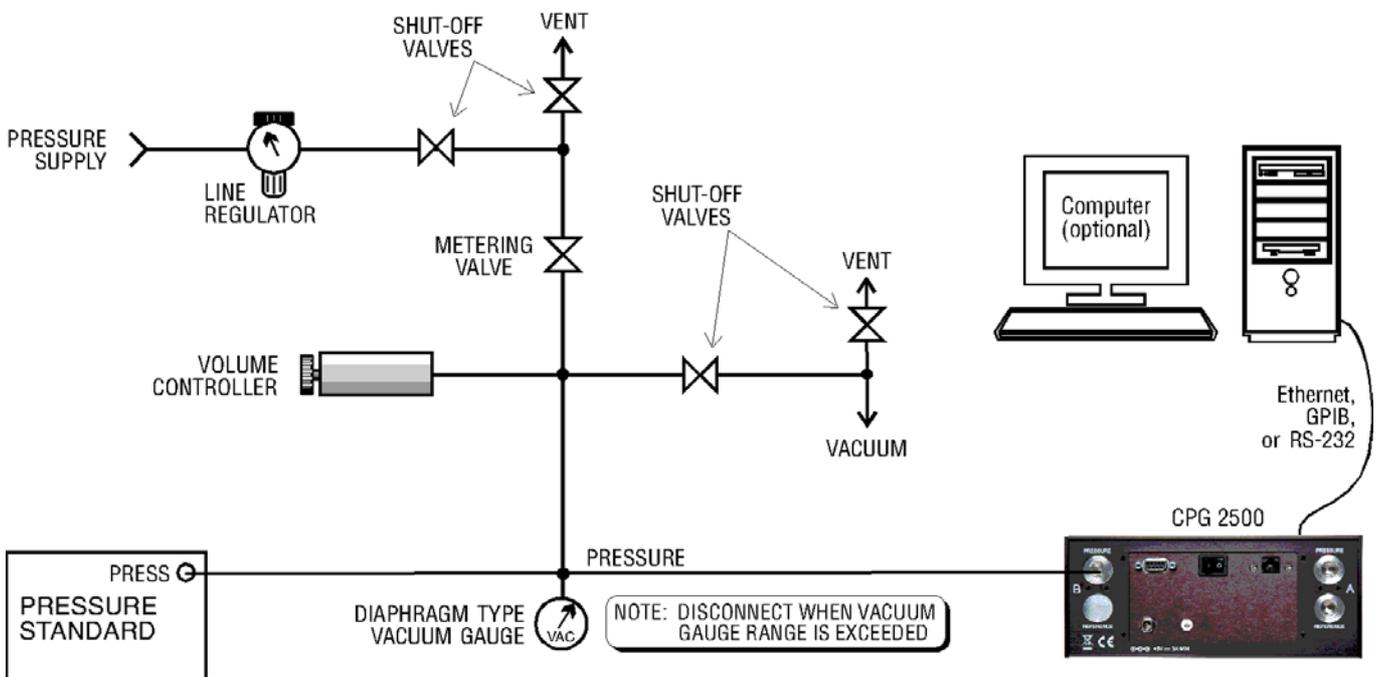
The recommended calibration medium is dry nitrogen or clean dry instrument air. A height variation between the standard and the CPG 2500 can cause significant errors. See “6.5.2.3.2 - Head Correction” in Section 6, Local Operation, for further information.

Digital Pressure Gauge SERIES CPG 2500

10.4 Setup

The following illustration for calibration setup shows a typical setup for either local or remote calibration for an absolute or gauge pressure instrument. The 'Optional Computer' is required only for performing a remote calibration.

The 'Pressure Standard' is normally a deadweight test instrument, and the 'Volume Controller' refers to a hand operated variable-volume pressure vernier device. A diaphragm type vacuum gauge is recommended over the gauge tube type of vacuum sensor for calibrating sub-atmospheric pressures. A vacuum source with the capacity to generate 600 millitorr is recommended.



10.5 Calibration

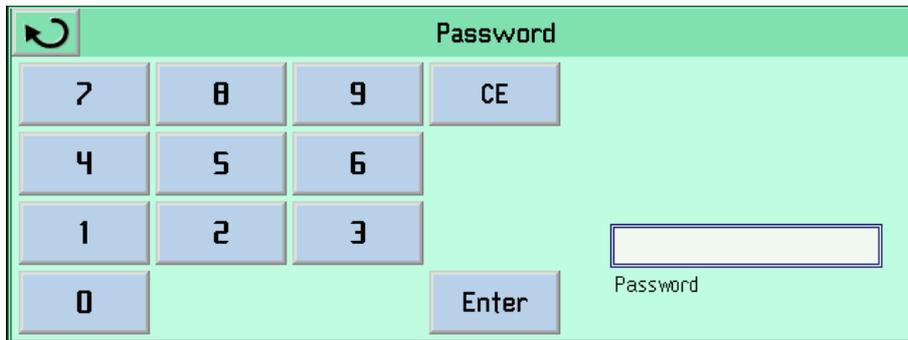
The calibration screen is password protected, and will require the operator to enter a password before proceeding.



Touch the channel setup key. Then touch the adjust tab.



Next, press the key and the password entry screen will appear.

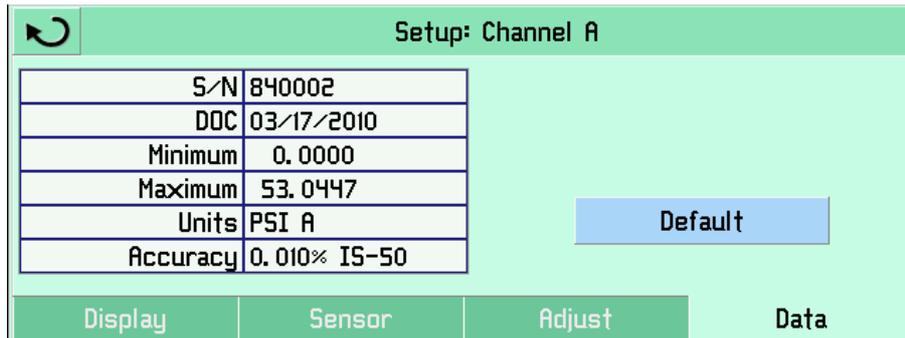


The password installed at the factory is 1 2 3 4 5 6. The operator can change this password as described in 10.5.2 - Utility Tab.

Digital Pressure Gauge SERIES CPG 2500

10.5.1 Sensor Tab

Press the Sensor tab to view information about the installed sensors. The radio buttons allow the operator to select which sensor information is displayed and which sensor is active in the calibration screens.



The screenshot shows the 'Setup: Channel A' screen. It features a table with sensor information and a 'Default' button.

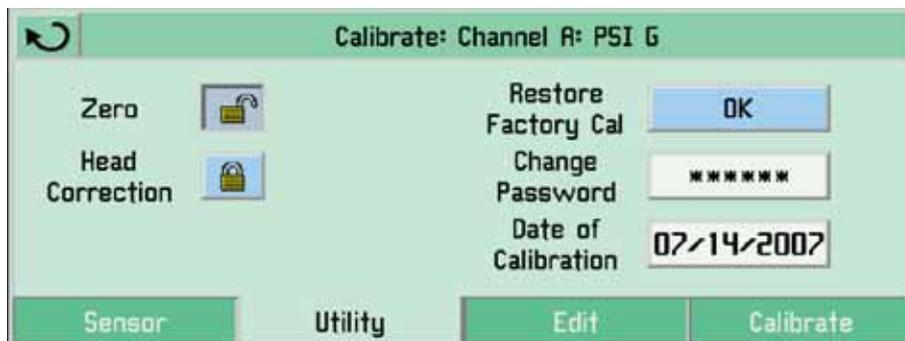
S/N	840002
DOC	03/17/2010
Minimum	0.0000
Maximum	53.0447
Units	PSI A
Accuracy	0.010% IS-50

Default

Display Sensor Adjust Data

10.5.2 Utility Tab

The Utility tab allows the user to perform certain administrative features for the CPG 2500.



The screenshot shows the 'Calibrate: Channel A: PSI G' screen. It features several utility options and a 'Calibrate' button.

Zero 

Head Correction 

Restore Factory Cal

Change Password

Date of Calibration

Sensor Utility Edit Calibrate

10.5.2.1 Zero and Head Correction

The padlocks indicate if the feature is accessible from the Channel Setup/Adjust tab. The padlock will change from locked to unlocked when pressed.

To adjust the Zero or Head Correction, see 6.5.2.3 - Channel Setup/Adjust tab in Section 6, Local Operation.

10.5.2.2 Restore Factory Cal

Press OK to restore the factory settings.

10.5.2.3 Change Password

1. Press this key to change the password. A number entry screen will be displayed. Enter from one to six digits for a new password. As each number is pressed it appears in the password window.



Caution

CAUTION: The password is seldom used and is easily forgotten. After a change, write down and save the new number. If the password is lost, contact Mensor.

2. Before proceeding, review the displayed digits for accuracy. A mistake here could prevent future access to this screen.
3. When satisfied that the new password is correct, and a written copy has been stored, press Enter to complete the entry.
4. Confirm the new password by pressing the back key, then returning to the Calibration screen. If this screen can't be accessed by using either the old or the new password contact Mensor.

10.5.2.4 Date of Calibration

Press the 'Date of Calibration' to enter the date of calibration in a (mm/dd/yyyy) format. Press the back key to save the new date of calibration in the sensor.

Digital Pressure Gauge SERIES CPG 2500

10.5.3 Edit Tab

Press the Edit tab to adjust the calibration with known data.

The screenshot shows the 'Calibrate: Channel A: PSI G' menu with the 'Edit' tab selected. The menu contains a table with two rows of calibration data. The 'Actual' value for the first row is 0.000, and for the second row, it is 100.000. The 'Desired' values are 0.000 and 100.000 respectively. The 'Edit' tab is highlighted at the bottom.

	Desired	Actual
1	0.000	0.000
2	100.000	100.000

Sensor Utility **Edit** Calibrate

10.5.4 Calibrate Tab

Press the Calibrate tab to adjust the sensor by applying a calibrated pressure.

The screenshot shows the 'Calibrate: Channel A: PSI G' menu with the 'Calibrate' tab selected. The menu contains a table with two rows of calibration data. The 'Actual' value for the first row is -0.001, and for the second row, it is 100.000. The 'Desired' values are 0.000 and 100.000 respectively. The 'Calibrate' tab is highlighted at the bottom.

	Desired	Actual
1	0.000	-0.001
2	100.000	100.000

Sensor Utility Edit **Calibrate**

Follow the instructions below according to which procedure is required. Procedure 1 should be used when you have 'as found' data. (If you pressed "Restore Factory Cal" you will have to re-generate the data. The values can be entered with no pressure applied to the external port). Procedure 2 should be used when doing an active calibration.

10.5.4.1 Procedure 1: For 'as found' data

1. Press the Calibrate/Edit tab. The pressure points should be within 20% of the minimum and maximum range of the channel.
2. Enter the points from the pressure standard in the first column (desired).
3. Enter the 'as found' readings of the 2500 in the second column (actual). Press [apply].

The second column will now contain the data from the first column. The readings should now be correct.

10.5.4.2 Procedure 2: For an active calibration

1. Go to the Calibrate/Calibrate tab. The pressure points should be within 20% of the min and max range of the channel.
2. Enter the standard (deadweight points) in the first column (desired).
3. Apply the first pressure to the instrument. When the pressure is within 1% full scale of the value in the first column the active column value will become live. (The actual column value will change from an indicator to a button and the value will start updating. Indicators have a plain black border and buttons have raised 3d borders). When the pressure is stable, press the actual column button, locking in the actual pressure. The index will now turn green.
4. Apply the second pressure to the instrument. When the pressure is within 1% full scale of the value in the first column, the actual column value will change from an indicator to a button.
5. When the pressure is stable, press the actual column button, locking in the actual pressure. When both indices are green, press [apply]. The readings should now be correct.

**Digital Pressure Gauge
SERIES CPG 2500**

NOTES

11. Appendix

Table 11.1 - Measurement Units (unitno)

Code	Description	Output Format
1	pounds per square inch	PSI
2	inches of mercury @ 0°C	inHg 0°C
3	inches of mercury @ 60°F	inHg 60°F
4	inches of water @ 4°C	inH2O 4°C
5	inches of water @ 20°C	inH2O 20°C
6	inches of water @ 60°F	inH2O 60°F
7	feet of water @ 4°C	ftH2O 4°C
8	feet of water @ 20°C	ftH2O 20°C
9	feet of water @ 60°F	ftH2O 60°F
10	millitorr	mTorr
11	inches of seawater @ 0°C 3.5% salinity	inSW
12	feet of seawater @ 0°C 3.5% salinity	ftSW
13	atmospheres	ATM
14	bars	Bar
15	millibars	mBar
16	millimeters of water @ 4°C	mmH2O 4°C
17	centimeters of water @ 4°C	cmH2O 4°C
18	meters of water @ 4°C	MH2O 4°C
19	millimeters of mercury @ 0°C	mmHg 0°C
20	centimeters of mercury @ 0°C	cmHg 0°C
21	torr	Torr
22	kilopascals	kPa
23	pascals	PA
24	dyne per square centimeter	Dy/cm2
25	grams per square centimeter	gm/cm2
26	kilograms per square centimeter	kg/cm2
27	meters of seawater @ 0°C 3.5% salinity	MSW
28	ounce per square inch	OSI

Digital Pressure Gauge SERIES CPG 2500

29	pounds per square foot	PSF
30	tons per square foot	TSF
31	percent of full scale	%FS
32	micron HG @ 0°C	μHg 0°C
33	ton per square inch	TSI
34	n/a	n/a
35	hectopascals	hPa
36	megapascals	MPa
37	millimeters of water @ 20°C	mmH2O 20°C
38	centimeter of water @ 20°C	cmH2O 20°C
39	meters of water @ 20°C	MH2O 20°C
n/a	User Units 1	User defined
n/a	User Units 2	User defined

11.2 Conversion Factors, PSI

The values listed in the column “To convert from PSI” are the values imbedded in the instrument program. The values listed under “To convert to PSI” are internally calculated approximations based on the imbedded values.

Table 11.2 - Conversion Factors, PSI

Code	Pressure Unit	To convert from PSI	To convert to PSI
1	PSI	1	1
2	inHg 0°C	2.036020	0.4911544
3	inHg 60°F	2.041772	0.4897707
4	inH2O 4°C	27.68067	0.03612629
5	inH2O 20°C	27.72977	0.03606233
6	inH2O 60°F	27.70759	0.03609119
7	ftH2O 4°C	2.306726	0.4335149
8	ftH2O 20°C	2.310814	0.4327480
9	ftH2O 60°F	2.308966	0.4330943
10	mTorr	51715.08	0.00001933672

Digital Pressure Gauge SERIES CPG 2500

11	inSW 0°C 3.5% salinity	26.92334	0.03714250
12	ftSW 0°C 3.5% salinity	2.243611	0.445710
13	ATM	0.06804596	14.69595
14	Bar	0.06894757	14.50377
15	mBar	68.94757	0.01450377
16	mmH2O 4°C	703.0890	0.001422295
17	cmH2O 4°C	70.30890	0.01422295
18	MH2O 4°C	0.7030890	1.422295
19	mmHg 0°C	51.71508	0.01933672
20	cmHg 0°C	5.171508	0.1933672
21	Torr	51.71508	0.01933672
22	kPa	6.894757	0.1450377
23	PA	6894.757	0.0001450377
24	Dy/cm ²	68947.57	0.00001450377
25	gm/cm ²	70.30697	0.01422334
26	kg/cm ²	0.07030697	14.22334
27	MSW 0°C 3.5% salinity	0.6838528	1.462303
28	OSI	16	0.0625
29	PSF	144	0.006944444
30	TSF	0.072	13.88889
31	%FS	(PSI / RANGE) x 100	(% FS x RANGE) / 100
32	μHg 0°C	51715.08	0.00001933672
33	TSI	0.0005	2000
35	hPa	68.94757	0.01450377
36	MPa	0.006894757	145.0377
37	mmH2O 20°C	704.336	0.001419777
38	cmH2O 20°C	70.4336	0.01419777
39	MH2O 20°C	0.704336	1.419777

Digital Pressure Gauge SERIES CPG 2500

11.3 Conversion Factors, Millitorr

The following table lists factors which should be used as multipliers when converting other pressure units to or from millitorr.

Table 11.3 - Conversion Factors, millitorr

Code	Pressure Unit	To convert from millitorr	To convert to millitorr
1	PSI	0.0001933672	51715.08
2	inHg 0°C	0.00003936995	25400.08909
3	inHg 60°F	0.00003948117	25328.53093
4	inH ₂ O 4°C	0.0005352534	1868.273977
5	inH ₂ O 20°C	0.0005362028	1864.966281
6	inH ₂ O 60°F	0.0005357739	1866.458778
7	ftH ₂ O 4°C	0.00004460451	22419.25773
8	ftH ₂ O 20°C	0.00004468356	22379.59744
9	ftH ₂ O 60°F	0.00004464783	22397.50637
10	mTorr	1.0	1.000000022
11	inSW 0°C 3.5% salinity	0.0005206091	1920.827359
12	ftSW 0°C 3.5% salinity	0.00004338408	23049.92831
13	ATM	0.000001315786	760002.2299
14	Bar	0.000001333220	750063.6259
15	mBar	0.001333220	750.0636259
16	mmH ₂ O 4°C	0.0135954	73.5540997
17	cmH ₂ O 4°C	0.001359544	735.5409971
18	MH ₂ O 4°C	0.00001359544	73554.09971
19	mmHg 0°C	0.001	1000.000022
20	cmHg 0°C	0.0001	10000.00022
21	Torr	0.001	1000.000022
22	kPa	0.0001333220	7500.636259
23	PA	0.1333220	7.500636259
24	Dy/cm ²	1.333220	0.750063626
25	gm/cm ²	0.001359506	735.561166
26	kg/cm ²	0.000001359506	735561.166

Digital Pressure Gauge SERIES CPG 2500

27	MSW 0°C 3.5% salinity	0.00001322347	75623.11663
28	OSI	0.0003093875	3232.1992
29	PSF	0.002784488	359.132477
30	TSF	0.000001392244	718265.0575
32	µHg 0°C	1.0	1.000000022
33	TSI	n/a	n/a
35	hPa	0.001333220	750.0636259
36	MPa	0.0000001333220	7500636.259
37	mmH2O 20°C	0.01361955	73.42388114
38	cmH2O 20°C	0.001361955	734.2388114
39	MH2O 20°C	0.00001361955	73423.88114

11.4 Conversion Factors, Pascal

The following table lists factors which should be used as multipliers when converting other pressure units to or from Pascal.

11.4 - Conversion Factors, Pascal

Unit No.	Pressure Unit	To convert from Pascal	To convert to Pascal
1	PSI	1.450377E-04	6.894757E+03
2	inHg 0°C	2.952997E-04	3.386390E+03
3	inHg 60°F	2.961339E-04	3.376850E+03
4	inH2O 4°C	4.014741E-03	2.490820E+02
5	inH2O 20°C	4.021862E-03	2.486410E+02
6	inH2O 60°F	4.018645E-03	2.488400E+02
7	ftH2O 4°C	3.345622E-04	2.988980E+03
8	ftH2O 20°C	3.351551E-04	2.983692E+03
9	ftH2O 60°F	3.348871E-04	2.986080E+03
10	mTorr	7.500636E+00	1.333220E-01
11	inSW 0°C 3.5% sal	3.904899E-03	2.560885E+02
12	ftSW 0°C 3.5% sal	3.254082E-04	3.073062E+03
13	ATM	9.869230E-06	1.013250E+05
14	Bar	1.00000E-05	1.00000E+05

Digital Pressure Gauge SERIES CPG 2500

15	mBar	1.00000E-02	1.00000E+02
16	mmH2O 4°C	1.019744E-01	9.806378E+00
17	cmH2O 4°C	1.019744E-02	9.806378E+01
18	MH2O 4°C	1.019744E-04	9.806378E+03
19	mmHg 0°C	7.500636E-03	1.333220E+02
20	cmHg 0°C	7.500636E-04	1.333220E+03
21	Torr	7.500636E-03	1.333220E+02
22	kPa	1.00000E-03	1.00000E+03
23	PA	1.00000E+00	1.00000E+00
24	Dy/cm2	1.00000E+01	1.00000E-01
25	gm/cm2	1.019716E-02	9.806647E+01
26	kg/cm2	1.019716E-05	9.806647E+04
27	MSW 0°C 3.5% sal	9.918444E-05	1.008222E+04
28	OSI	2.320603E-03	4.309223E+02
29	PSF	2.088543E-02	4.788025E+01
30	TSF	1.044271E-05	9.576052E+04
32	μHg 0°C	7.500636E+00	1.333220E-01
33	TSI	7.251885E-08	1.378951E+07
35	hPa	1.00000E-02	1.00000E+02
36	MPa	1.00000E-06	1.00000E+06
37	mmH2O 20°C	1.021553E-01	9.789017E+00
38	cmH2O 20°C	1.021553E-02	9.789017E+01
39	MH2O 20°C	1.021553E-04	9.789017E+03



Mensor Corporation
201 Barnes Drive
San Marcos, Texas 78666

Phone: 512.396.4200
Fax: 512.396.1820
Web site: www.mensor.com
email: sales@mensor.com

CPG 2500 Operation Manual
Part Number 0017851001 F
June, 2010