



PM930SD

USER'S MANUAL



LIQUID OR AIR PRESSURE METER WITH DATALOGGING SD CARD

Please read this manual carefully and thoroughly before using this product.

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INTRODUCTION

Thank you for purchasing General Tools & Instruments' PM930SD Liquid or Air Pressure Meter with Datalogging SD Card. Please read this user's manual carefully and thoroughly before using the instrument.

The PM930SD is a general purpose handheld instrument suitable for measuring pneumatic and hydraulic pressures in automotive, mechanical engineering, HVAC/R (heating, ventilation, air-conditioning, and refrigeration) and food-processing environments.

The PM930SD has the performance and features needed to satisfy the most demanding aspects of the above applications. It works with any of eight optional pressure sensors, each with a different full-scale range (2, 5, 10, 20, 50, 100, 200 and 400 bar). A front-panel pushbutton enables rapid switching among sensors with no need for precalibration. Another front-panel pushbutton facilitates fast switching among the following 10 commonly used pressure units: Bar, psi, kg/cm², mm Hg, inches Hg, meters H₂O, inches H₂O, atmospheres, hectopascals (hPA) and kilopascals (kPA).

Because it is microprocessor-based, the PM930SD can make full use of the portability, reliability and large storage capacities that SD memory cards offer. Pressure measurements can be made automatically at any sampling rate between one second and nine hours. After time-stamping and storing the measurements on an SD card plugged into the instrument (a process called datalogging), the user can remove the card and plug it into a laptop or desktop computer either directly or via a USB card reader. The data logs are stored on the card as files with the .xls extension, which can be opened by Microsoft's Excel application.

The PM930SD has a backlit 2-1/2 in. diagonal display and is powered by six "AA" Alkaline batteries or an optional 9-VDC AC adapter.

KEY FEATURES

- Measures hydraulic or pneumatic pressure using optional sensors with full-scale ranges from 2 to 400 bar
- Sensors calibrated by single push of a button
- Ten different pressure units selectable via front panel
- Displays maximum and minimum readings
- Performs real-time automatic datalogging at sampling time settable from 1 second to 9 hours
- Also supports manual logging and changing of card storage location
- Outputs Excel-compatible data logs
- Accepts SD memory cards of up to 16 GB capacity
- Big (2.5 in. diagonal) front-panel green backlit LCD is easy to read
- Auto power off function
- Powered by six "AA" batteries or optional 9V AC/DC adapter

OPERATING INSTRUCTIONS

WHAT'S IN THE CASE

The PM930SD comes fully assembled in a carrying case along a 2 GB SD memory card with this user's manual.

Optional accessories available from General Tools & Instruments include eight optional pressure sensors, each with a different full-scale range (2, 5, 10, 20, 50, 100, 200 and 400 bar) and a 9VDC adapter for a 110V power supply. See the Optional Accessories section of this manual for more details.

Figure 1 shows all of the controls and indicators on the front, back, top, bottom and right side of the PM930SD. It also shows the main components of an optional pressure sensor. Familiarize yourself with the positions and functions of these controls, indicators and ports before moving on to the setup procedure.

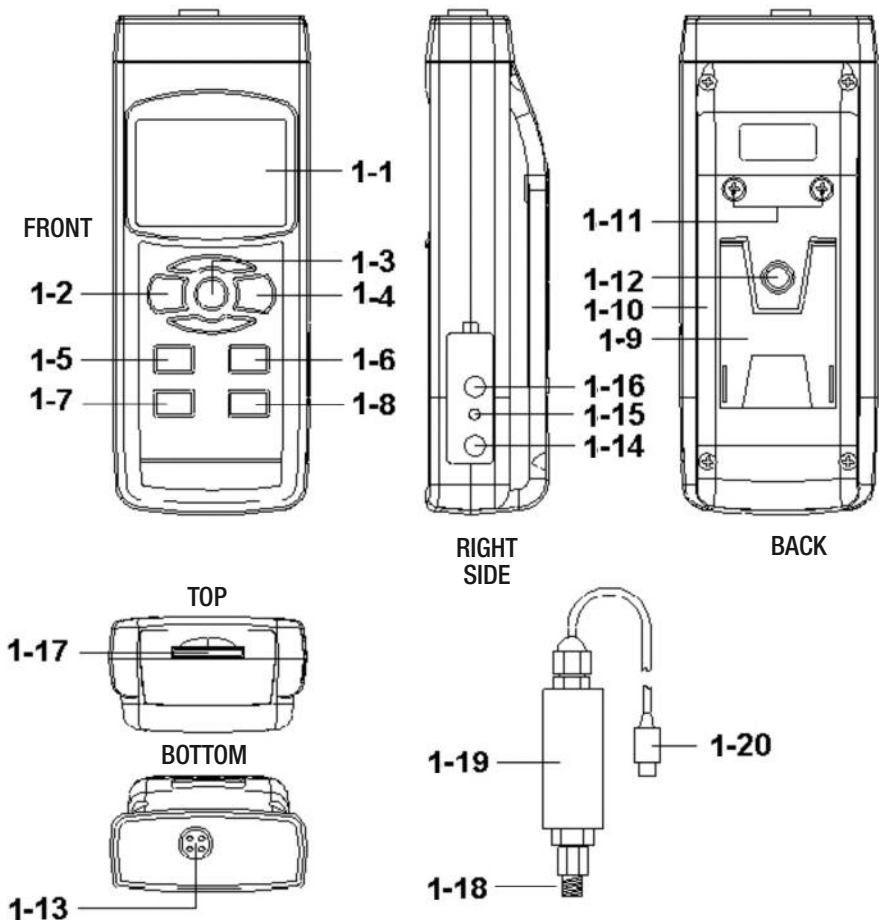


Fig. 1. The PM930SD's controls and indicators and other physical features

- 1-1 Liquid-crystal display
- 1-2 POWER button
- 1-3 HOLD/ESC button
- 1-4 REC/ENTER button
- 1-5 ▲ button
- 1-6 ▼ button
- 1-7 TIME button
- 1-8 LOGGER SET button
- 1-9 Kickstand
- 1-10 Battery compartment cover
- 1-11 Battery compartment cover screws
- 1-12 Tripod attachment nut
- 1-13 Pressure sensor socket
- 1-14 Socket for 9VDC AC adapter
- 1-15 Reset button
- 1-16 RS232 output jack
- 1-17 SD card socket
- 1-18 Pressure sensor port
- 1-19 Pressure sensor
- 1-20 Pressure sensor connector

SETUP

1. Choose the power source. Before using the PM930SD, be sure it is powered by fresh batteries or an optional 9VDC AC adapter plugged into the bottom jack on its right side (callout 1-14).

To remove the battery compartment cover, remove the two screws holding it in place (callout 1-11). Then install six “AA” batteries in the correct orientation, using the polarity marks on the inside of the compartment as a guide. Replace the cover by replacing the two screws.

2. Install an SD card. To prepare for setup, also install the supplied 2 GB SD memory card or another card with a capacity from 1 GB to 16 GB in the socket on the bottom of the PM930SD (callout 1-17). When installing the card, make sure its gold contacts are facing front and push the card into the socket until you hear a click. To remove the card, push it in until you hear a click and the card pops out.

Now power on the instrument by pressing the POWER button (callout 1-2) to generate a short beep. (To power off the PM930SD, press the POWER button and hold it until the instrument responds with a long beep.)

When the pressure meter powers on, a series of transient startup screens will briefly appear. Once the display has stabilized, perform the following seven setup steps in the order presented.

1. Format the SD card. Press the LOGGER SET button (callout 1-8) and hold it for at least five seconds, until “Sd-F” appears in the lower half of the display. Quickly (within three seconds) press the REC/ENTER button.

(If you press buttons too slowly in setup mode, the screen will revert to the normal display. To return to the setup sequence, press and hold the LOGGER SET button again. To move ahead to the next field in the sequence or to the next parameter, press the HOLD/ESC button.)

Pressing the REC/ENTER button causes the word “no” or “yES” to appear over the term “Sd-F”. Press the SET ▼ button to make a selection. Choose “yES” whenever a new SD card is being used, or when a used card is being repurposed (from use with another SD card instrument or a camera, for example) and all data on it is to be erased. Choose “no” to preserve any data on a card previously used with this instrument.

If you choose “yES”, after you press the REC/ENTER button the instrument will prompt you to confirm that decision by displaying the term “Ent” below “yES” and sounding three beeps. To confirm that you want to begin the erasure/formatting procedure, press the REC/ENTER. “Ent” will then flash several times and the instrument will sound another three beeps to confirm that the SD card has been erased and formatted.

2. Set the date and time. Once the SD card has been set up, the word “dAtE” will appear in the center of the display, along with the flashing value “00.00.00” at the lower left, above “yy.mm.dd”. Set the current year by pressing the ▼ or ▲ button repeatedly until the correct value appears above “yy”. Press the REC/ENTER button to store the setting. The next screen that appears will have the value above “mm” flashing. Use the ▼ or ▲ button to navigate to the current month and press the REC/ENTER button to store the setting. When the next screen flashes the value above “dd”, again use the ▼ or ▲ button to navigate to the current day and press the REC/ENTER button to store the setting.

Once you have set the date, the display will prompt you to set the hour, minute and second of the current time. Again use the ▼ or ▲ buttons to navigate to the correct values, and the REC/ENTER button to store the settings.

3. Set the datalogging sampling time. Once the date and time have been set and stored, the display will show a value below the letters “SP-t”. Press the ▼ or ▲ button to decrease or increase the flashing hour value until the desired number appears below “SP-t”. Press the REC/ENTER button to store that setting. The minutes value will then flash. Press the ▼ or ▲ button to decrease or increase the value and then press the REC/ENTER button to store that setting. Finally, press the ▼ or ▲ button to decrease or increase the flashing seconds value and then press the REC/ENTER button to store that setting. This completes the setting of the pressure meter’s datalogging sampling time.

4. Enable or disable auto power off. Once the sampling time has been set and stored, the display will show the word “yES” over the term “PoFF”. Press the ▼ button until the desired automatic power off management scheme (“yES” for enable; “no” for disable) is displayed. Press the REC/ENTER button to store the selection. If enabled, the power off function shuts off the PM930SD after a period of inactivity of ten minutes.

5. Enable or disable the beeper. Once the auto power off function has been enabled or disabled, the display will show the word “yES” over the word “bEEP”. Press the ▼ button until the desired setting (“yES” or “no”) is displayed, and then press the REC/ENTER button to store the selection.

6. Choose a decimal point or comma to represent the decimal division between integers and fractions (for example, American-style 20.88 vs. European-style 20,88). Once the beeper has been enabled or disabled, the display will show the word “bASIC” above the phrase “dEC”. Press the ▼ button to make “bASIC” (American style) or “Euro” appear in the upper display, as desired. Press the REC/ENTER button to store the selection.

7. Choose the full-scale range of the optional pressure sensor. Once the format of decimal divisions has been set and stored, the term “tyPE” will appear in the lower part of the display. Above it will appear the default value “2”, for a 2-bar sensor. Press the ▼ or ▲ button until the value displayed matches the full-scale range, in bar, of your optional sensor. General Tools & Instruments offers pressure sensors with full-scale ranges from 2 bar to 400 bar. Press the REC/ENTER button to store the setting.

Once the pressure sensor’s range has been set and stored, the display will then either return to the first of the seven steps in the setup sequence—choosing whether or not to format the SD memory card—or show the term “ESC”. If “ESC” appears, press either the HOLD/ESC button or the LOGGER SET button to exit the setup procedure and enter normal operating mode.

NORMAL OPERATION

1. To prepare to measure pressure:

- Plug the connector (callout 1-20 of Fig. 1) of an optional pressure sensor (callout 1-19) into the socket on the top of the meter (callout 1-13).
- Power on the meter by pressing the POWER button. Press the ▼ button (which has the word “Sensor” stenciled above it) once to confirm that the sensor’s full-scale range is the same as the one you stored as Step 7 of the setup procedure.
- Press the ▲ button (which has the word “Unit” stenciled above it) repeatedly until the desired pressure unit appears on the display. The table below correlates available pressure units with their display readings.

Pressure unit	Display reading
psi	PSI
inches Hg	In Hg
inches H ₂ O	In H2O
hPA	hPA
kPA	PA
bar	bAr
kg/cm ²	g C2
mm Hg	--Hg
meters H ₂ O	-t H2O
Atmospheres	AtP

After confirming the display unit, power off the meter and then power it on again. This will make the chosen unit the default display unit.

If the display does not show a zero value after the pressure sensor has been plugged into the instrument, press the TIME button (which has the word “Zero” stenciled above it) on the front panel and hold it for at least 10 seconds, until the display shows a zero reading.

2. To measure pneumatic or hydraulic pressure, connect the sensor’s port (callout 1-18) to the equipment you wish to measure. The PM930SD will measure the pressure at the interface point and display it in the unit you selected.

Whenever the PM930SD is in measurement mode, you can turn off the backlight (which is on by default) by briefly pressing (but not holding) the POWER/ESC button. To reactivate the backlight, briefly press the button again.

Whenever the instrument is in measurement mode, you also can check the current date and time by briefly pressing the TIME button. Doing so causes both values to appear briefly at the lower left of the display.

HOLDING AND STORING MEASUREMENTS

- 1. To hold a measured value** of pressure, press the HOLD/ESC button during the measurement. Doing so will cause the word “HOLD” to appear at the top of the display. Pressing the HOLD/ESC button again releases the hold.
- 2. To record and recall readings**, press the REC/ENTER button while making measurements. This will make the term “REC” appear at the top of the display. Pressing the REC/ENTER button again, briefly, will make the term “MAX” appear to the right of “REC” and switch the display to the maximum value stored in memory during the last recording session. Pressing the REC/ENTER button again, briefly, will make the term “MIN” appear to the right of “REC” and switch the display to the minimum value stored during the last session.
- 3. To exit recording mode**, press and hold the REC/ENTER button for at least three seconds, until the term “REC” disappears from the top line of the display. The display will then revert to showing the current reading.

AUTOMATIC VS. MANUAL DATALOGGING

The PM930SD can automatically log data at a user-selected sampling period from 1 second to 9 hours. To view the sampling time for which the instrument was set up, press the LOGGER SET button (which has the words “Sampling check” stenciled below it) once. To change the sampling time, perform Step 3 of the setup procedure.

- 1. To start automatic datalogging**, press the REC/ENTER button once. The top line of the display will then show the term “REC”. Pressing the LOGGER SET button at this point will make REC flash and add the flashing term “LOGGER” at the top right of the display. This indicates that the instrument is currently storing measured values and their time stamps in memory.
- 2. To pause automatic datalogging**, press the LOGGER SET button once; this action makes the flashing term LOGGER disappear from the top right of the display and changes the term “REC” from flashing to constant. Pressing the LOGGER SET button again resumes automatic datalogging.
- 3. To end automatic datalogging**, press the REC/ENTER button and hold it for at least two seconds. This action causes the “REC” message to disappear.
- 4. To log data manually**, set the sampling time to zero using the procedure detailed earlier. Then press the REC/ENTER button once. The display will show the term “REC” on the top line, a value in the middle, and below it the letter “P” on the left and a number from 1 to 99 on the same line to the right. The number indicates the position on the SD card that will be used to store manually logged data.

Now press the LOGGER SET button. This will cause the beeper to sound and the term “LOGGER” to briefly appear at the upper right of the display. As in automatic datalogging mode, in this mode the instrument is storing measurements and their time stamps on the SD card.

In manual datalogging mode, however, measurements are being stored continuously (with a sampling time of zero), and their locations on the card can be changed.

5. To change the storage location of manually logged data, press the ▼ button once; this causes the “P” to disappear from the left side of the display and the value on its line to begin flashing. Once the flashing begins, you can use the ▼ and ▲ buttons to change the flashing value to any number between 1 and 99. Once you have chosen the storage location, press the REC/ENTER button to save the setting. This causes the value to stop flashing and the “P” to return.

6. To end manual datalogging, press the REC/ENTER button and hold it for at least three seconds. This action causes the “REC” message to disappear from the top line of the display.

TRANSFERRING DATA FROM THE SD CARD TO A COMPUTER

After automatic or manual datalogging of measurements, remove the SD card from the PM930SD and plug it into your computer either directly (if it has an SD card slot) or through an SD card reader.

Because the files containing time-stamped data logs have the extension .xls, they open in Microsoft’s Excel application. Figures 2 and 3 show two kinds of Excel presentations: a data-only screen and a graphics-only screen.

	A	B	C	D	E
1	Position	Date	Time	Chl_Value	Chl_Unit
2	1	2009/10/19	10:18:58	0.042	Bar
3	2	2009/10/19	10:19:00	0.044	Bar
4	3	2009/10/19	10:19:02	0.042	Bar
5	4	2009/10/19	10:19:04	0.038	Bar
6	5	2009/10/19	10:19:06	0.05	Bar
7	6	2009/10/19	10:19:08	0.05	Bar
8	7	2009/10/19	10:19:10	0.046	Bar
9	8	2009/10/19	10:19:12	0.044	Bar
10	9	2009/10/19	10:19:14	0.046	Bar
11	10	2009/10/19	10:19:16	0.046	Bar
12	11	2009/10/19	10:19:18	0.05	Bar
13	12	2009/10/19	10:19:20	0.052	Bar
14	13	2009/10/19	10:19:22	0.046	Bar
15	14	2009/10/19	10:19:24	0.048	Bar
16	15	2009/10/19	10:19:26	0.046	Bar

Fig. 2. Typical Excel data-only screen

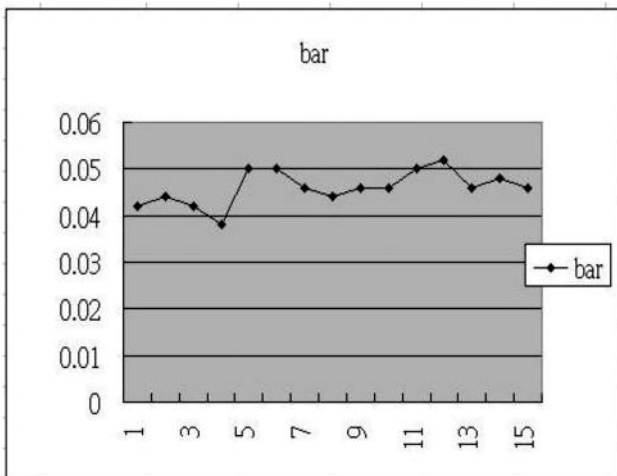



Fig. 3. Typical Excel graphics-only screen

SPECIFICATIONS

Embedded microcontroller	Custom one-chip LSI device
Display type	Liquid-crystal with green backlight
Display size	2.05 x 1.5 in. (52 x 38mm)
Displayed pressure unit	bar, psi, inches Hg, inches H ₂ O, hPA, kPA, kg/cm ² , mm Hg, meters H ₂ O, atmospheres
Measurement accuracy	± 0.5% of full-scale reading + 1 digit
Stored readings	Maximum, minimum
Datalogging sampling time	Settable between 1 second and 8 hours, 59 minutes, 59 seconds (in automatic datalogging mode)
SD card capacity	1 GB to 16 GB
Settable parameters	Date, time, auto power off, beep sound, sampling time, decimal point or comma decimal division, optional pressure sensor's full-scale range (2, 5, 10, 20, 50, 100, 200 or 400 bar)
Operating temperature	32° to 122°F (0° to 50°C)
Operating relative humidity	0 to 85%
Power source	6 Alkaline "AA" batteries or optional 9-VDC AC adapter
Power consumption	5 mADC (normal operation, with backlight off and SD card not saving data); 25 mADC with backlight on and card saving data; 37 mADC with backlight on and card saving data
Dimensions of meter	6.97 x 2.68 x 1.77 in. (177 x 68 x 45mm)
Weight of meter	0.77 lb. (350g)

MAINTENANCE & TROUBLESHOOTING TIPS

Keep the pressure sensor(s) clean and protected from the elements when not in use.

When the icon  appears in the left corner of the display, it's time to replace the six "AA" batteries that power the instrument (although measurements will remain valid for several hours after the low-battery indicator first appears). Replacing the batteries requires removing the two screws that hold the battery compartment cover in place, as explained earlier. After inserting fresh batteries in the correct orientation, tighten the screws to secure the cover.

If the meter "freezes" (like a computer) and buttons become unresponsive, try resetting the instrument by pushing the RESET button on its right side (callout 1-15 of Fig. 1) with the end of a paper clip.

Remove the batteries when storing this product for an extended period of time.

Do not drop or disassemble the meter or immerse it in water.

OPTIONAL ACCESSORIES

- Pressure sensors with the following full-scale ranges:
2, 5, 10, 20, 50, 100, 200 and 400 bar
- 9-VDC adapter for 110VAC power supply

WARRANTY INFORMATION

General Tools & Instruments' (General's) PM930SD Liquid or Air Pressure Meter with Datalogging SD Card is warranted to the original purchaser to be free from defects in material and workmanship. Subject to certain restrictions, General will repair or replace this instrument if, after examination, the company determines it to be defective in material or workmanship for a period of one year.

This warranty does not apply to damages that General determines to be from an attempted repair by non-authorized personnel or misuse, alterations, normal wear and tear, or accidental damage. The defective unit must be returned to General Tools & Instruments or to a General-authorized service center, freight prepaid and insured.

Acceptance of the exclusive repair and replacement remedies described herein is a condition of the contract for purchase of this product. In no event shall General be liable for any incidental, special, consequential or punitive damages, or for any cost, attorneys' fees, expenses, or losses alleged to be a consequence of any damage due to failure of, or defect in any product including, but not limited to, any claims for loss of profits.

RETURN FOR REPAIR POLICY

Every effort has been made to provide you with a reliable product of superior quality. However, in the event your instrument requires repair, please contact our Customer Service to obtain an RGA (Return Goods Authorization) number before forwarding the unit via prepaid freight to the attention of our Service Center at this address:

General Tools & Instruments
80 White Street
New York, NY 10013
212-431-6100

Remember to include a copy of your proof of purchase, your return address, and your phone number and/or e-mail address.



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Specifications subject to change without notice

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