



# INSTRUCTION MANUAL

## PM01, PM015, PM100

Hand-Held Monitors for Vacuum & Pressure Measurement



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## ABOUT THIS MANUAL

The following symbols are used in this guide:

 This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.

 This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.



Fig. 1—Pressure Manometer

## INTRODUCTION

Hand-held and battery operated, PM Series Pressure Monitors simplify vacuum and pressure measurements. An integral transducer and digital display allow easy and accurate pressure readings. Three separate versions measure pressures in the range of  $\pm 1$  psi,  $\pm 15$  psi, or  $\pm 100$  psi. A range switch allows measurement in units of psi or kPa for the 100 psi version, and psi or mmHg for the 1 and 15 psi versions. Pressure can be read on the built-in LCD display, or monitored on the recorder output.

Standard versions are equipped with a 9V alkaline battery. Rechargeable versions use a nickel/cadmium battery and come complete with a charger.

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## Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 7 of this manual. Please contact WPI Customer Service if any parts are missing at 941.371.1003 or [customerservice@wpiinc.com](mailto:customerservice@wpiinc.com).

**Returns:** Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 7 of this manual.

## INSTRUMENT DESCRIPTION

### Controls

On/Off	Turns instrument power on and off.
Zero	Adjusts the meter reading to zero at ambient pressure.
psi/kPa	Selects the pressure range; psi or kPa for the PM100, (psi/mmHg) psi or mmHg for the PM01 and PM015.
Port A & B	Inverting (Port A) and Non-inverting (Port B) inputs to the pressure transducer.
Charger	Input for the charger (rechargeable versions only).
Record	Voltage output proportional to pressure.

## **OPERATING INSTRUCTIONS**



**WARNING: DO NOT USE ANY OF THE PM SERIES PRESSURE MONITORS WITH WATER OR AQUEOUS SOLUTIONS, ESPECIALLY SALT SOLUTIONS.**

### **Power up**

Turn the instrument on by moving the On/Off switch to the On position. For non-rechargeable units using alkaline batteries, battery life is approximately 200 hours. Rechargeable units will operate for approximately 25 hours on fully-charged nickel/cadmium batteries. The rechargeable units can be operated continuously by connecting the charger to the charger input, either with or without batteries in the unit.

### **Fluid connections**

Soft tubing, such as the vinyl tubing supplied with the unit, can be slipped directly onto the barbed ports of the Pressure Monitor. The outer diameters of the ports are 0.190" (4.8 mm), so tubing can be used with inner diameters of 1/8", 3/16" or 5/32".

When using pressures higher than 30 psi with the PM100, the tubing clamps supplied with the unit should be used. Insert the tubing through the clamp, and push the tubing firmly onto the barbed port. Screw the clamp onto the tubing at the port.

Do not apply pressures greater than the proof pressure to either of the ports. For the PM100 the proof pressure is 150 psi (1035 kPa); for the PM015 the proof pressure is 30 psi (1550 mmHg); for the PM01 the proof pressure is 20 psi (1035 mmHg).

For standard operation, pressure tubing should be connected to Port B, which will give readings of the correct sign, positive or negative, on the meter. Readings from Port A will always be opposite in sign to those applied.

Readings taken using just one port are relative to ambient pressure and are termed gauge measurements (as opposed to absolute.).

### **Differential readings**

For differential readings, pressure tubing may be connected to both ports. The meter displays the difference in pressure between Port B and Port A, (Port B - Port A).

### **What fluids can be used?**

The transducer in the Pressure Monitor is compatible with most non-aqueous fuels, oils, refrigerants, hydraulic fluids, and non-corrosive gases. Fluids must generally be compatible with silicon gel, plastic, aluminum, RTV, silicon, and glass.

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## Selecting the range

Select the units displayed on the meter using the psi/kPa switch on the PM100, or the psi/mmHg switch on the PM015 and PM01. No zeroing is necessary when the range is switched.

## Zeroing

If the Pressure Monitor drifts from a reading of zero at ambient pressure, adjust the Zero potentiometer with a small screwdriver.

## Recording

A voltage output proportional to the pressure is available at the Record output. This voltage may be used to monitor pressure on a chart recorder, oscilloscope or other recording equipment. Connection is made via a mini-phone plug (0.141" outer diameter). A mini-phone-to-BNC cable is available (WPI #**CLB102**).

For the PM01 Pressure Monitor the Record output is 300 mV/psi ( $\pm 0.3$  V full scale); for the PM015 Pressure Monitor the Record output is 100 mV/psi ( $\pm 1.5$  V full scale); for the PM100 the output is 10 mV/psi ( $\pm 1$  V full scale).

## Calibration

Calibration of the pressure readings should be unnecessary under normal circumstances. If the Pressure Monitor appears to be out of calibration during its warranty period, it should be returned to the factory for inspection and recalibration. You may calibrate the instrument yourself, however this will void the warranty if it is still in effect. First, zero the instrument at ambient pressure. Then remove the cover by unscrewing the four screws on the back of the instrument. Apply a known pressure to Port B of the Pressure Monitor and adjust the trimming potentiometer labelled R11 on the circuit board until the meter displays the correct pressure. For best accuracy the applied pressure should be at least half of the full-scale reading.

## MAINTENANCE

### Replacing the battery

When the battery begins to run low, a LO BAT indication will be displayed on the meter. Remove the battery by sliding open the battery compartment on the rear of the instrument and disengaging the old battery from the clip. Replace with a comparable battery; a 9V alkaline type (WPI No. 2101) for the PM01D, PM015D and PM100D, or 7.2V nickel/cadmium type (WPI No. 3414) for the PM01R, PM015R and PM100R. Alkaline batteries may be used in the PM01R, PM015R and PM100R, but no attempt should be made to recharge these batteries, or to use the charger while

these batteries are in the instrument. CHARGING AN ALKALINE CELL MAY CAUSE IT TO EXPLODE.

## Charging the batteries

Batteries may be recharged in the PM01R, PM015R and PM100R by plugging the charging unit into a line-powered outlet and plugging the power jack of the charger into the Pressure Monitor Charger input. Batteries may be charged with the unit turned on or off, but the batteries will charge more slowly with the unit turned on. The Pressure Monitor will function without a battery, if the charger is connected.

## SPECIFICATIONS

This unit conforms to the following specifications:

	<b>PM01</b>	<b>PM015</b>	<b>PM100</b>
Pressure Ranges	±1 psi (±52 mmHg)	±15 psi (±775 mmHg)	±100 psi (±690 kPa)
Proof Pressure	20 psi (1035 mmHg)	30 psi (1550 mmHg)	150 psi (1035 kPa)
Resolution	0.001 psi (1 mmHg)	0.01 psi (1 mmHg)	0.1 psi (1 kPa)
Output	1V/psi	100 mV/psi	10 mV/psi
Output Range	±1.0 V	±1.5 V	±1.0 V

Linearity .....	0.5% full-scale
Temperature Effect .....	1.0% full-scale (0-70 C)
Zero.....	Screwdriver-adjust
Response Time.....	30 ms
Power.....	One 9V alkaline or rechargeable battery
Battery Life .....	200 hr (alkaline battery) 25 hr (rechargeable battery)
Output Connector .....	Mini-phone, 0.141"
Output Impedance.....	1000 Ω
Pneumatic Connectors.....	Barbed, for 1/8" or 3/16" ID soft tubing
Dimensions .....	3.12" (w), 5.88" (l), 1.5" (d)
Weight .....	0.5 lbs (0.25 kg)

PM Series Pressure Monitors come with 4 ft of 1/8" ID soft vinyl tubing. A mini-phone-to-BNC cable for the Record output (WPI #**CLB102**) is optional. Non-rechargeable versions contain one 9V alkaline battery. Rechargeable versions come with one nickel/cadmium battery and a 120/240V-switchable battery charger.

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## APPENDIX A: PRESSURE CONVERSIONS

	psi	in. H <sub>2</sub> O	in. Hg	kPa	mBar	cm H <sub>2</sub> O	mmHg
psi	1.000	27.680	2.036	6.8947	68.947	70.308	51.715
in. H <sub>2</sub> O	0.036127	1.0000	0.073554	0.2491	2.491	2.5400	1.8683
in. Hg	0.4912	13.596	1.000	3.3864	33.864	34.532	25.400
kPa	0.14504	4.0147	0.2953	1.000	10.000	10.1973	7.5006
mBar	0.01450	0.40147	0.02953	0.100	1.000	1.01973	0.75006
cm H <sub>2</sub> O	0.014223	0.3937	0.028958	0.09806	0.9806	1.000	0.7355
mmHg	0.019337	0.53525	0.039370	0.13332	1.3332	1.3595	1.000

**NOTE:** In. H<sub>2</sub>O at 39° F; in. Hg at 32° F; cm H<sub>2</sub>O at 4° C; mmHg at 0° C

## **WARRANTY**

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

## **Claims and Returns**

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container.

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

## **Repairs**

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

*\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*



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