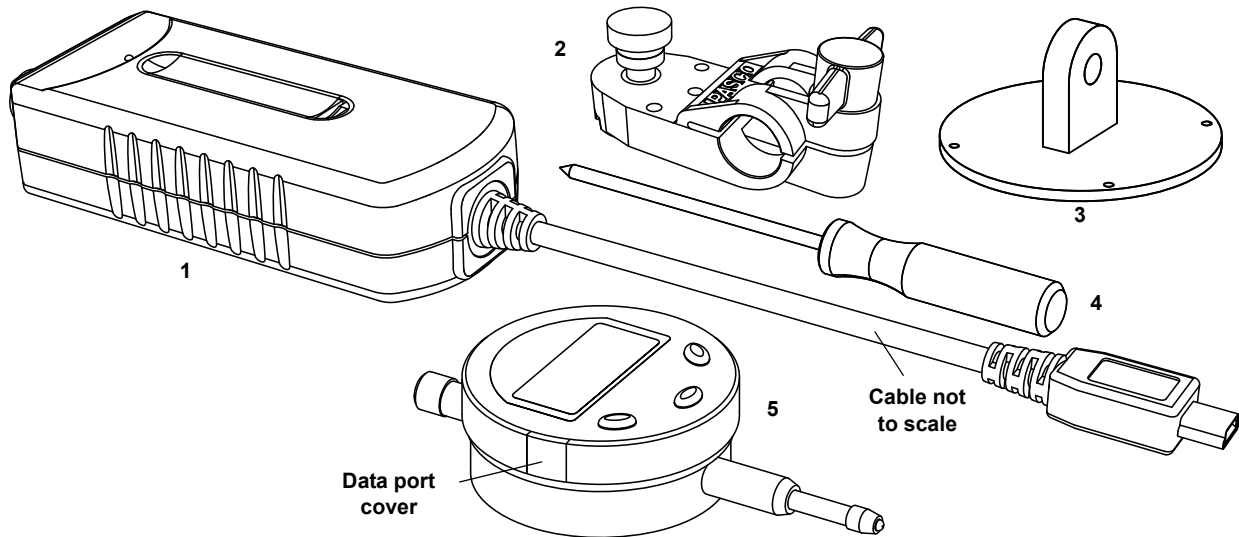




PASPORT Displacement Sensor

PS-2204



Included Equipment	Part Number
1. Displacement Sensor	PS-2204
2. Pivot Rod Clamp	
3. Back Plug Panel	
4. Phillips Screwdriver #0	
5. Digital Indicator	ME-8701
Storage Box for items 3, 4, 5, and a spare battery (not shown)	
Compatible PASCO Interfaces	Part Number
Xplorer GLX	PS-2002
Xplorer	PS-2000
PowerLink	PS-2001
USB Link	PS-2100
SPARK SLS	PS-2008
SPARKlink	PS-2009
Other	Part Number
Large Base and Support Rod (optional)	ME-9355
PASCO Structure Set	See PASCO catalog

Introduction

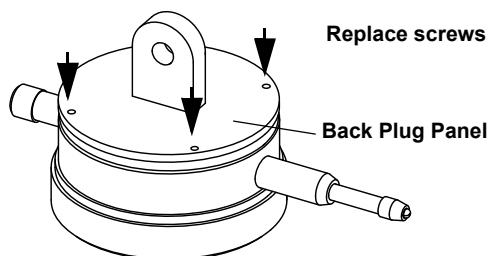
The PASPORT Displacement Sensor works with a Digital Indicator to measure displacements to within 0.01 millimeters or 0.5 mils (thousandths of an inch) over a range of 10.00 millimeters (0.3937 inches or 393.7 mils). The Displacement Sensor comes with a Digital Indicator, a Pivot Rod Clamp for mounting the indicator on a support rod (not included), and a screwdriver for removing or replacing the back panel of the indicator.

The sensor cable from the Displacement Sensor connects to a small data port on the left side of the indicator. The Displacement Sensor can be connected to any PASPORT interface.

The Displacement Sensor is ideally suited to measure the small deflections of members of a structure built using one of PASCO's Structure Sets. For example, the sensor can dynamically measure the deflection of the road bed of a bridge when a load is applied to the structure.

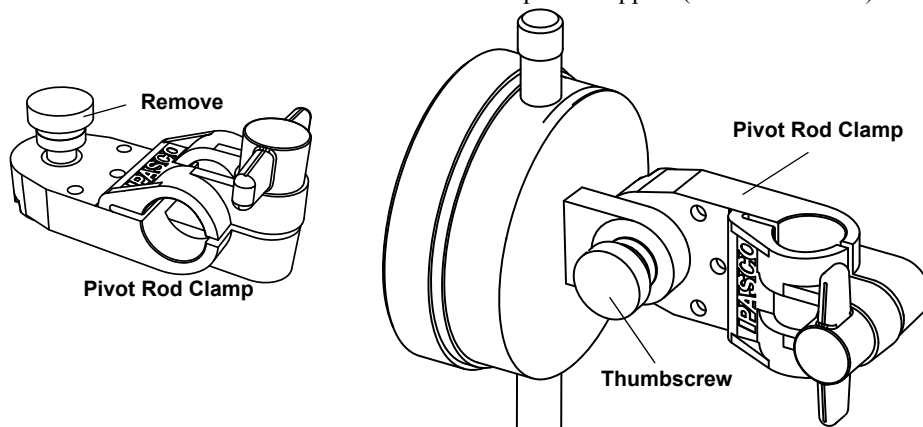
Assembly

The Digital Indicator can be mounted on a support rod up to 12 mm in diameter. To mount the indicator on a support rod, first replace the flat back panel of the indicator with the back plug panel found in the storage box. Use the small screwdriver from the storage box to unscrew the flat back panel. (Be careful to keep the screws.) Align the back plug panel with the back of the indicator and replace the four small screws.



Usage

Unscrew the round thumbscrew from the Pivot Rod Clamp. Align the hole in the back plug panel on the indicator with the hole in the Pivot Rod Clamp and replace the round thumbscrew. Mount the Pivot Rod Clamp on a support (12 mm diameter).



About the Digital Indicator

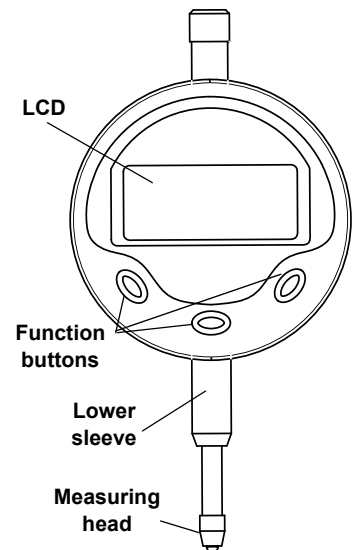
The Digital Indicator has a four and one-half digit liquid crystal display (LCD), a measuring head, lower sleeve, and three function buttons (ON/O, M, and mm/in). Zero-setting can be done at any position of the measuring head to allow differential measurement.

Function Buttons

ON/O: This is the “On-Off” and zero-setting button. If the indicator is off, press and hold the ON/O button to turn the indicator on. Press and release the ON/O button to set the zero point. Press and hold the ON/O button for several seconds to turn the indicator off. (Note: The Digital Indicator has an automatic power off feature.)

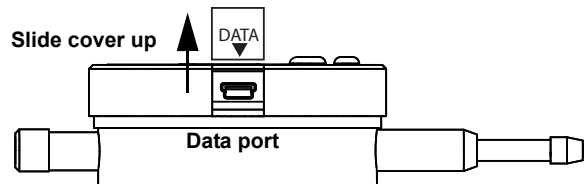
M: This is the data hold button. Press and release to turn data holding ‘on’ and press and release again to turn it off. (The interface software will continue to show the current position of the measurement head.)

mm/in: This button toggles between measurements in millimeters and measurements in inches. The default setting is ‘mm’. Press and release the button to switch to ‘inch’. Press and release again to switch back to ‘mm’. Note that the DataStudio software program used with a PASPORT interface is set to show *millimeters* (mm) or *mils* (thousandths of an inch). Open the Experiment Setup window in DataStudio to select the proper unit of measure.



Data Port

The data port is located on the left side of the Digital Indicator behind a small cover labeled DATA. Slide the cover up to remove it (but don't lose it). The data port accepts the plug on the end of the Displacement Sensor cable.



Battery

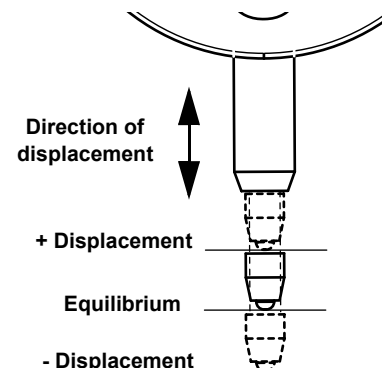
Flashing digits show that the battery is very low. The Digital Indicator uses a 1.55 volt SR44 silver oxide battery. To replace the battery, use the screwdriver to remove the four small screws on the back panel and then remove the back panel. The battery is under a circular cover. Loosen - but do not remove - the small screw that holds the cover in place. Rotate the cover to the side and replace the battery (+ side facing up). While holding the battery down, rotate the cover back into place. Tighten the screw, put the back panel on, and install the four small screws.

Take out the battery if the Digital Indicator is not in use for a long time.

Setup

Measurement Setup

Mount the Digital Indicator so that it is in contact with the object whose displacement will be measured. Arrange the indicator so that the measurement head and lower sleeve are aligned with the direction of the displacement.



If the object will be displaced both positively and negatively from its equilibrium position, adjust the indicator so that the position of the measurement head when it is in contact with the object is about halfway between the limits of the measurement head's travel. Press and release the ON/O button to zero the indicator when the measurement head is at the equilibrium position.

Hardware Setup

The following three steps can be performed in any order.

1. Connect the cable of the Displacement Sensor (PS-2204) to the data port on the side of the Digital Indicator. Turn on the indicator.

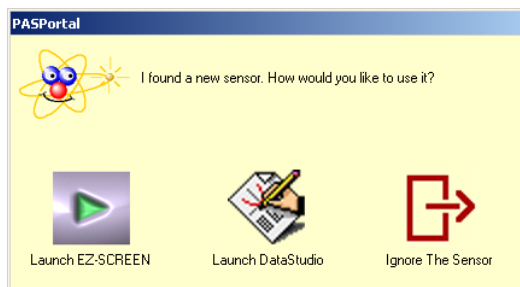
The connector on the Displacement Sensor cable fits into the Digital Indicator in only one way.

2. Connect the end of the PASPORT Displacement Sensor to a PASPORT interface.
3. If you will be using a computer, connect the PASPORT interface to the computer's USB port.

DataStudio Setup

If you will be using the PASPORT Displacement Sensor with a computer, install the latest version of DataStudio first. Check the PASCO web site at www.pasco.com for information.

1. When you connect the PASPORT Displacement Sensor to the computer through a PASPORT interface, the PASPortal window will launch automatically (if DataStudio is not already running).



2. Select *Launch DataStudio* in the PASPortal window.



A *Digits display for displacement* will open automatically.

3. Click to begin data collection.

You do not need to adjust the sample rate.

Xplorer, Xplorer GLX, and SPARK SLS Setup

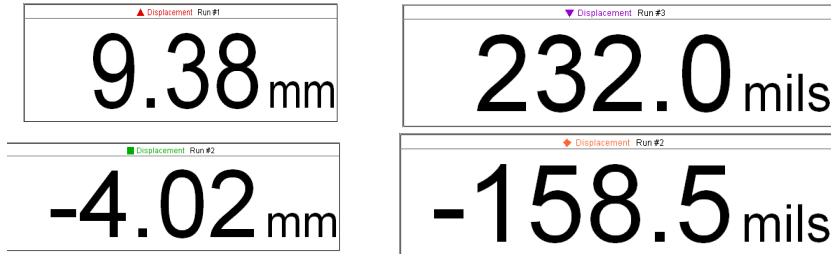
If you will be using an Xplorer, Xplorer GLX, or SPARK SLS that is not connected to a computer, connect the PASPORT Displacement Sensor to the interface and press

 or  to begin data collection.

NOTE: A green light-emitting diode (LED) on the Displacement Sensor flashes while the sensor is connected to a Digital Indicator that is turned on.

Measurements

The following are examples of Digits displays for displacement in millimeters (mm) and thousandths of an inch (mils).



Specifications

Measurement Range	10.00 mm
Hysteresis Error	±0.02 mm
Resolution	0.01 mm
Default Sample Rate	5 Hz
Maximum Speed of Measured Object	± 0.6 m/s
Working Humidity	≤ 80%
Storage Temperature	-10 to +60 °C

Points of Attention

1. Keep the digital indicator clean. Prevent water and other fluids from getting into the apparatus.
2. Never clean the indicator with organic solvents. Use alcohol containing no water.
3. Keep the data port cover in place when the data port is not in use. Never touch the data port with any metal objects except the plug on the cable of the sensor.
4. Do not mark the digital indicator with an electric pen as this might damage its electronic components.

Digital Indicator Maintenance

Trouble	Possible causes	Solutions
Flashing digits	Low voltage	Replace the battery
No display	Low voltage Poor contact	Replace the battery. Adjust and clean the battery seat.
Fixed digits	Accidental trouble in the circuit	Take out the battery and put it back after one minute.

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: 916-786-3800 (worldwide)
800-772-8700 (U.S.)

Fax: (916) 786-3292

Web: www.pasco.com

Email: support@pasco.com

Limited Warranty For a description of the product warranty, see the PASCO catalog. **Copyright** The PASCO scientific 012-10689A *PASPORT Displacement Sensor Instruction Manual* is copyrighted with all rights reserved. Permission is granted to non-profit educational institutions for reproduction of any part of this manual, providing the reproductions are used only in their laboratories and classrooms, and are not sold for profit. Reproduction under any other circumstances, without the written consent of PASCO scientific, is prohibited. **Trademarks** PASCO, PASCO scientific, DataStudio, PASPORT, Xplorer, Xplorer GLX, and SPARK SLS are trademarks or registered trademarks of PASCO scientific, in the United States and/or in other countries. For more information visit www.pasco.com/legal. Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries. Mac is a trademark of Apple Computer, Inc., registered in the U.S. and other countries.

Patents Pending

The following PASCO products have patents pending:

ME-6990 Truss Set	PS-2198 Load Cell Amplifier	PS-2200 100 N Load Cell
ME-6991 Bridge Set	PS-2199 Load Cell and Amplifier Set	PS-2201 5 N Load Cell
ME-6992 Advanced Structures Set	PS-2205 Dual Load Cell Amplifier	ME-6940 Diffusion-Osmosis Apparatus
ME-6995 Road Bed Spares		

Product End of Life Disposal Instructions:

This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service, or the place where you purchased the product.



The European Union WEEE (Waste Electronic and Electrical Equipment) symbol (to the right) and on the product or its packaging indicates that this product **must not** be disposed of in a standard waste container.