

Temperature Array

PS-2157



Included Equipment

Part Number

1. Temperature Array	PS-2157
2. Eight-probe Bundle	514-09083
3. Fast Response Temperature Probes (qty. 3)	PS-2135 (3-pack)
4. Adhesive Patches (qty. 10)	PS-2525 (100-pack)

Compatible Temperature Probes

Fast-response Temperature Probes	PS-2135 (3-pack)
Stainless Steel Temperature Probe	PS-2153
Skin/Surface Temperature Probe	PS-2131
10 k Ω thermistors embedded in other PASCO devices	see PASCO catalog or www.pasco.com

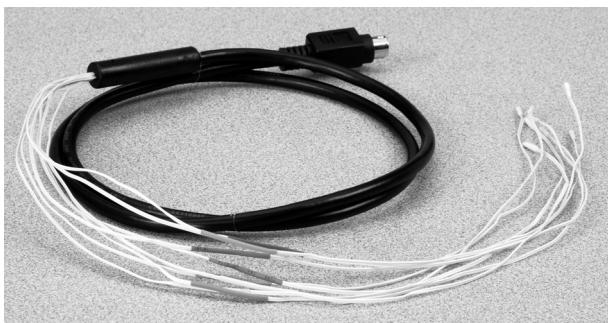
Compatible PASPORT Interfaces

Xplorer GLX	PS-2002
Xplorer	PS-2000
Power Link	PS-2001
USB Link	PS-2100

Introduction

The PASPORT Temperature Array works with up to eight temperature probes and a PASPORT interface to collect multiple streams of temperature data at up to 200 samples per second per channel.

Separate temperature probes (such as the three included fast-response probes) can be connected to the individual input ports, numbered 1 through 8 (right); or the special eight-probe bundle (below) can be connected to the multiport (below right).

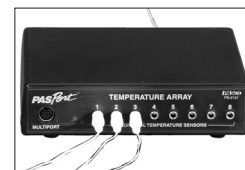


Eight-probe bundle

Each of the probes in the eight-probe bundle is identified by a colored band. The colors correspond to the Temperature Array's data channel numbers as shown in the table (right).

When measuring the surface temperature of a person or object, use the included adhesive patches to attach the probes.

Other PASCO devices containing embedded 10 k Ω thermistors (such as the Heat Conduction Apparatus, TD-8513) can be connected to the individual ports or the multiport of the Temperature Array using the cables included with those devices.



**Three probes
connected to
individual ports**



**Eight-probe bundle
connected to multiport**

Color	Data Channel Number
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8

The color scheme is similar to the one commonly used to identify resistor values.

Setup

Hardware Setup

The following three steps can be performed in any order.

1. Connect the eight-probe bundle to the multiport *or* connect up to eight separate temperature probes to the individual input ports.

Probes can be connected to the individual ports in any order (you don't have to start with port 1), and any of the ports can be left unconnected.

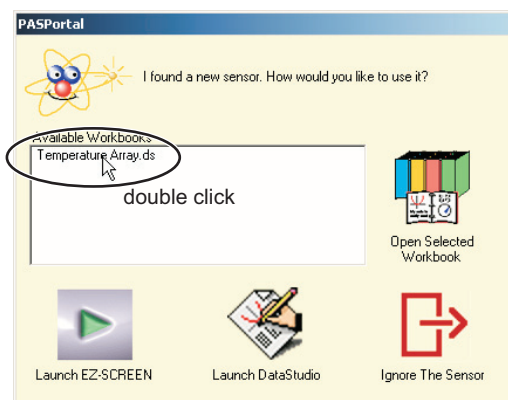
Do not use the individual ports and the multiport at the same time.

2. Connect the cable of the Temperature Array 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 Temperature Array with a computer, install DataStudio version 1.9.5 first.

1. When you connect the Temperature Array to the computer through a PASPORT interface, the PASPortal window will launch automatically (if DataStudio is not already running).
2. Double click *Temperature Array.ds* to open the Temperature Array's configured file in DataStudio.



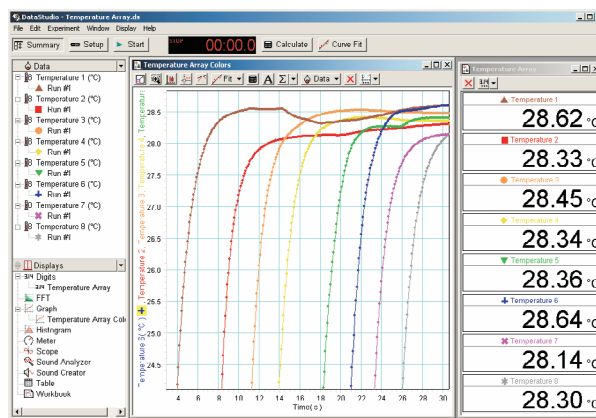
To open to configuration file directly, navigate to the folder `c:\Program Files\DataStudio\ELabs\Sensors\ (Windows)` or `HD:\Applications\DataStudio\ELabs\Sensors\ (Mac)`.

- The configuration file contains a run of sample data showing the data color corresponding to each data channel.

To delete the sample data before collecting your own data, press **Alt+Minus (Windows)** or **⌘+Minus (Mac)**.

- Click **Start** to begin data collection.

To view and change the sample rate, units of measure, and other sensor properties, click **Setup**.



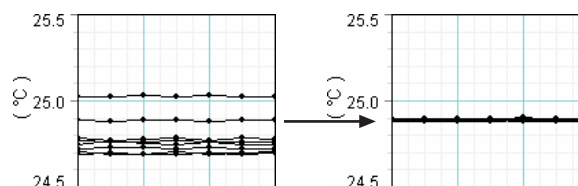
DataStudio configuration file, *Temperature Array.ds*

Xplorer and Xplorer GLX Setup

If you will be using an Xplorer or Xplorer GLX in logging mode (not connected to a computer), connect the Temperature Array to the Xplorer or Xplorer GLX and press **▶** to begin data collection.

Multiple-measurement Alignment

When you are using multiple temperature probes, you may find that their reading differ slightly when they are measuring the same thing. In the example illustrated (right), measurements from eight probes in the same container of water vary by about 0.3 °C. The multiple-measurement alignment procedure adjusts the calibrations of the probes so they agree more closely.



The procedure described here for DataStudio can also be performed on the Xplorer GLX. See the *Xplorer GLX Users' Guide* for detailed instructions.

- Click **Setup** to open the Experiment Setup window. Click **Calibrate Sensors...** to open the calibration dialog box.
- From the Sensor field, select the Temperature Array.
- Select the “Calibrate all similar measurements simultaneously” option.
- Place all of the probes in a container of room-temperature water. (If you are calibrating thermistors embedded in a device, allow the thermistors to come to equilibrium at room temperature.)
- Observe the Present Sensor Measurement and wait until it has stabilized.
- From the Calibration Type menu, select 1 Point (Adjust Offset Only).
- Click the Read From Sensor button for Point 1.
- Click OK to accept the new calibration; or click Cancel to revert to the previous or default calibration.

Two-point calibration

Though it is usually not necessary, a two-point calibration can be performed on a single probe, or on all probes simultaneously, to make the measurements more accurate. For step-by-step instructions refer to the documentation for DataStudio version 1.9.5, the Xplorer, or the Xplorer GLX.

Oversampling

The degree of oversampling that takes place within the Temperature Array depends on the sample rate and the number of connected probes. To maximize the oversampling, set the sample rate as low as possible and disconnect any unused probes. In many cases, increased oversampling reduces noise, produces smoother data, and improves the measurement resolution. This effect is especially noticeable when very small temperature changes are measured.

Measurement Repetition

At high sample rates, the Temperature Array may occasionally repeat a measured value in order to maintain the flow of data without exceeding its processing capacity. The maximum sample rate at which this does *not* occur depends on the number of connected probes, as shown in the table (right).

At sample rates above these thresholds, you may notice that a rapidly changing temperature graph has occasional plateaus where the sampled temperature remains constant for two or more points in a row. To reduce the effect of measurement repetition, use the smooth(n, x) function in DataStudio's calculator. (For information about the smooth function, open the Help menu in DataStudio and search for "smooth.")

**Maximum Sample Rate
without
Measurement Repetition**

Number of Probes	Rate (Hz)
1	200
2 or 3	100
4 to 8	50

Specifications

Measurement Range	-35 °C to 135 °C (probe dependent)
Maximum Range of Fast-response Probes and Eight-probe Bundle	-35 °C to 70 °C
Accuracy	±0.5 °C
Resolution	0.0025 °C
Repeatability	0.01 °C
Maximum Sample Rate	200 Hz per Temperature Sensor
Unit Options	°C, °F, K

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 012-08867A *Temperature Array 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, and Xplorer GLX 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 trademark of Apple Computer, Inc., registered in the U.S. and other countries.