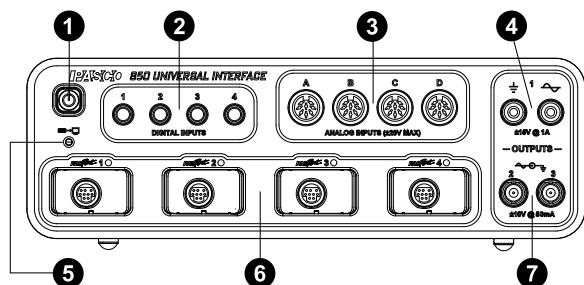


# 850 Universal Interface (UI-5000)



## 1 ON/OFF button

Press and briefly hold to turn the interface on or off. The button features an LED which glows blue to indicate that the interface is on.

## 2 Digital input ports

Plug digital ScienceWorkshop sensors in here to connect them to the interface.

## 3 Analog input ports

Plug analog ScienceWorkshop sensors in here to connect them to the interface.

## 4 Output ports (banana jack)

Used by the signal generator to output signals of power up to 15 W.

## 5 Connection Status LED

Indicates the status of the interface's connection to a computer.

Connection LED	Status
Blinking green	Ready to connect
Green ON	Connected

## 6 PASPORT input ports

Plug PASPORT sensors in here to connect them to the interface.

## 7 Output ports (BNC)

Used by the signal generator to output signals of power up to 500 mW

### Included equipment:

- 850 Universal Interface (UI-5000)
- AC adapter, 100-240 V AC to 20 V DC at 6 A (120 W), with power cord
- USB cable

### Required equipment:

- USB-compatible computer
- Any PASPORT, ScienceWorkshop, or Universal Interface sensor(s)
- PASCO Capstone software

### Recommended equipment:

- Banana Plug Cord (SE-9750 and SE-9751) for Output 1
- BNC Function Generator Output Cable (UI-5119 and UI-5129) for Outputs 2 and 3

## Introduction

The PASCO 850 Universal Interface is a USB multi-port data acquisition interface designed for use with any non-wireless PASCO sensor and PASCO Capstone software (available separately). Users can plug a sensor into one of the twelve input ports on the interface, perform the necessary setup in Capstone, and then begin collecting data. Capstone can be used to record, display, and analyze the data measured by the sensor. Because each interface has a unique device ID, multiple interfaces can be connected to a computer at the same time. PASCO Wireless sensors can also be used in Capstone alongside the 850.

The 850 Universal Interface comes with a USB cable for connecting to a computer, as well as a power supply (AC adapter with power cord) that converts an input of 100 to 240 V AC into an output of 20 V DC at 6 A.

The 850 Universal Interface includes three built-in signal generator and power outputs. Output 1 provides up to 15 watts of power, and Outputs 2 and 3 provide up to 500 milliwatts of power each. The interface can be configured to output direct current (DC) or alternating current (AC) in a variety of waveforms, including sine, square, and triangle waves.



**NOTE:** The 850 Universal Interface is compatible with all PASCO PASPORT, Universal Interface, and ScienceWorkshop sensors. The PASPORT sensors have a "PS-" prefix, the Universal Interface sensors have a "UI-" prefix, and the ScienceWorkshop sensors have a prefix of "CI-", "ME-", "SN-", or "TD-". For more information about the compatible sensors, see the PASCO website at [www.pasco.com/sensors](http://www.pasco.com/sensors).

## Get the software

Using the interface requires PASCO Capstone software. We offer a free trial of Capstone for Windows and Mac. To get the software, go to [pasco.com/downloads](http://pasco.com/downloads).

If you have installed the software previously, check that you have the latest update by opening the **Help** menu and selecting **Check for Updates**.

## Check for a firmware update

1. Press and hold the power button until the LED turns on.
2. Open PASCO Capstone.
3. Connect the interface to PASCO Capstone as described under **Set up the hardware**.
4. A notification appears if a firmware update is available. Click **Yes** to update the firmware.
5. Close Capstone once the update is complete.

## Set up the hardware

### General guidelines

The included power supply (AC adapter) and USB cables are required for operation. Always plug the power cord of the AC adapter into a standard, grounded wall outlet.



**WARNING:** The 850 Universal interface is not waterproof. To avoid the risk of shock, keep the interface, AC adapter, and cable away from water and other liquids *at all times*. If conducting an experiment with water or other liquids, keep the liquid container(s) away from the interface. For maximum protection, keep liquid containers closed whenever possible.

During operation, do not cover the heat sink "fins" on the back of the interface, as these fins help prevent the interface from overheating during prolonged use.

### Connecting the 850 Universal Interface to your computer

1. Connect the larger end of the USB cable to a USB port or powered USB hub connected to your computer.
2. Connect the smaller end of the USB cable to the USB port on the back of the interface.
3. Connect the AC adapter plug to the power jack on the back of the interface box.
4. Connect the AC power cord to a grounded wall outlet.
5. Push the power button to turn on the interface. The interface will beep once, and the green LEDs above the PASPORT input ports will blink once.

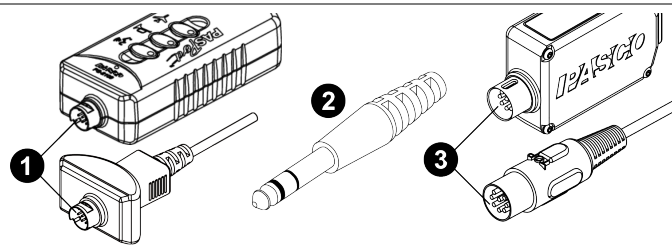
The green Connection Status LED below the power button should light up to indicate that the interface is now connected to the computer. If it does not, check the connection between the interface and the computer.

### Plugging a sensor into the interface

- PASPORT sensors plug into the ports labeled with **PASPORT** and a number.
- ScienceWorkshop *analog* sensors with DIN connectors plug into the **analog inputs**, labeled A, B, C, and D on the interface.
- ScienceWorkshop *digital* sensors with stereo phone (tip-ring-sleeve) plugs connect into the **digital inputs**, labeled 1, 2, 3, and 4 on the interface.



**NOTE:** PASCO Capstone will automatically detect and recognize connected PASPORT and Universal Interface sensors, but not ScienceWorkshop analog or digital sensors. For information on connecting these sensors to the program, see the manual for the individual sensor, as well as the PASCO Capstone online help.



- 1 PASPORT plugs
- 2 Stereo phone plugs
- 3 DIN plugs

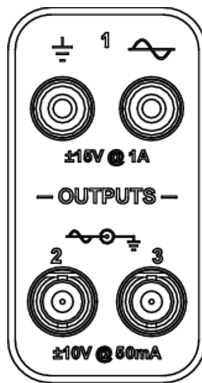
### Extender cables

If you need extra distance between the sensor and the 850 Universal Interface, use an extender cable such as the 8-Pin DIN Extension Cable (UI-5218), PASPORT Sensor Extension Cable (PS-2500), or Phone Jack Extender Cable (PI-8117). Note that the 8-Pin DIN Cable Assembly included with several ScienceWorkshop sensors, such as the Light Sensor (CI-6504A), can also be used as an extension cable, although Universal Interface sensors specifically require the DIN Extension Cable (UI-5218).



**IMPORTANT:** DO NOT connect more than one extender cable between a sensor and the 850 Universal Interface. Connect the sensor to the interface either directly or, at most, through *one* extender cable.

### Using the 850 Interface as a signal generator



The PASCO 850 Universal Interface has three signal output ports on its front panel. Output 1 is a signal generator with a built-in power amplifier. This port has two 4 millimeter (mm) banana jack ports that can provide  $\pm 15$  volts at up to 1 amp (or 15 watts) for a variety of AC waveforms (including sine, square, triangle, and positive and negative ramps), or direct current (DC) if needed. The output frequency range for the waveforms is 0.001 Hz to 100,000 Hz (or 100 kHz), with a resolution of 0.001 Hz. The output has over-current detection, voltage offset and limiting, phase shift, selectable current limiting (0.55 A, 1.10 A, or 1.5 A), and a frequency sweep function.

Outputs 2 and 3 are signal generators with BNC connectors that can provide  $\pm 10$  V at up to 50 mA (or 500 mW) for the same waveforms as Output 1. The frequency range for these ports is 0 to 500,000 Hz (500 kHz) for the sine wave, with lower maximum frequencies for the other waveforms and a resolution of 0.001 Hz for all waveforms. These outputs have voltage limiting, phase shift, and a frequency sweep function.

The output for all three signal generators is controlled by PASCO Capstone software. The interface can measure the output voltage, frequency, and peak amplitude for all three output ports, as well as the output current for Output 1.

## Signal generator setup

To set up the 850 Universal Interface to act as a signal generator, follow these steps based on the output port being used.

### Output Port 1:

1. Insert a banana patch plug cord into the ground port ( $\perp$ ) of Output 1. Connect the other end of the cord to the ground on the circuit board (or other device) which will be supplied with a signal.
2. Insert a second banana patch plug cord into the signal generator port ( $\sim$ ) of Output 1. Connect the other end of the cord to the positive lead on the circuit board (or other device).

### Output Port 2 or 3:

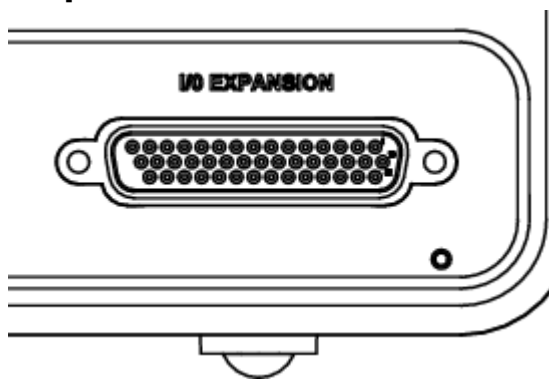
1. Connect the output port on the 850 Universal Interface to one end of a BNC Function Generator Output Cable, shrouded (UI-5129) or unshrouded (UI-5119). Ensure a stable connection by tightening the BNC connector.
2. Connect the other ends of the 850 Universal Interface to the circuit board or other device which will be supplied with a signal. Make sure to attach the red lead to the positive lead on the device and the black lead to the ground on the device.

## Signal generator configuration

For information on setting up the signal generator using PASCO Capstone, consults the Capstone online help and search for "**Set up signal generator**". The online help contains information on how to configure various features of the signal generator, including (but not limited to):

- Waveform
- Frequency
- Amplitude
- Phase Shift
- Voltage Offset
- Sweep Type

## 850 Expansion Port



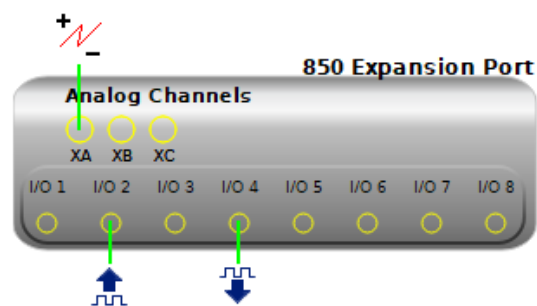
The back of the 850 Universal Interface features a 44-pin Expansion Port. This port can be used to connect the interface to a breadboard, allowing the interface to process additional input and output signals beyond those from the ports on the front of the device.

The Expansion Port provides access to the following features:

- 3 additional analog input channels, labeled **XA**, **XB**, and **XC** in PASCO Capstone.
- 8 digital input/output (I/O) channels, labeled **I/O 1** through **I/O 8** in Capstone.
- An additional port for each of the three outputs of the signal generator, outputting the same signals as the ports on the front panel.

## Connecting to the Expansion Port

To access the Expansion Port in PASCO Capstone, first connect your 850 Universal Interface to Capstone as described in **Set up the hardware**. From the **Hardware Setup** panel, select the **Show Expansion Port** icon to display the Expansion Port interface within the window. To hide the panel, click the **Show Expansion Port** icon again.



The channels of the 850 Expansion Port can be connected as follows:

- The analog channels can be configured as either a voltage sensor or a peak amplitude sensor.
- The digital channels can be configured as either a digital output or a digital input.
- All of the inputs and outputs of the Expansion Port are available to use in Blockly programs within Capstone.



**NOTE:** The Expansion Port's analog inputs have a limit of 10 V. The digital I/O ports can be set to output either 3.3 V or 5 V using the Digital Output tool in Capstone. The Digital Output tool can also be used to turn individual digital outputs on or off.

## Pin definitions

The 850 Expansion Port features 44 pins, each of which serves a different function when connected. The pins on the expansion port are numbered from right to left and from top to bottom. In the top row, pin 1 is located on the far right and pin 15 is located on the far left; in the middle row, pin 16 is on the right and pin 30 is on the left; and in the bottom row, pin 31 is on the right and pin 44 is on the left.

The functions of each pin are as follows:

- Pins 1-8: Digital I/O ports (**I/O 1** through **I/O 8**)
- Pins 9-13: PASPORT Serial Peripheral Interface (SPI) port
  - Pin 9: SCLK
  - Pin 10: MISO

- Pin 11: MOSI
- Pin 12: SSn
- Pin 13: INTRn
- Pin 14: Provides a constant +5 V DC at 1 A
- Pins 15-28: Ground
- Pin 29: Analog Input **XA**, inverting
- Pin 30: Analog Input **XA**, non-inverting
- Pin 31: Analog Input **XB**, inverting
- Pin 32: Analog Input **XB**, non-inverting
- Pin 33: Analog Input **XC**, inverting
- Pin 34: Analog Input **XC**, non-inverting
- Pin 35: Output port for **Output 2** of the signal generator
- Pin 36: Return (ground) port for **Output 2** of the signal generator
- Pin 37: Output port for **Output 3** of the signal generator
- Pin 38: Return (ground) port for **Output 3** of the signal generator
- Pin 39: Provides a constant +12 V DC at 150 mA
- Pin 40: Provides a constant -12 V DC at 150 mA
- Pins 41-42: Output port for **Output 1** of the signal generator
- Pins 43-44: Return (ground) port for **Output 1** of the signal generator

## Software help

The PASCO Capstone Help provide additional information on how to use this product with the software. You can access the help within the software or online.

**Software:** Help > PASCO Capstone Help

**Online:** [help.pasco.com/capstone](http://help.pasco.com/capstone)

## Specifications and accessories

Visit the product page at [pasco.com/product/UI-5000](http://pasco.com/product/UI-5000) to view the specifications and explore accessories. You can also download support documents from the product page.

## Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Chat [pasco.com](http://pasco.com)
-  Phone 1-800-772-8700 x1004 (USA)  
+1 916 462 8384 (outside USA)
-  Email [support@pasco.com](mailto:support@pasco.com)

## Regulatory information

### Limited warranty

For a description of the product warranty, see the Warranty and Returns page at [www.pasco.com/legal](http://www.pasco.com/legal).

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### Product end-of-life disposal



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 or disposal service, or the place where you purchased the product. The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

### CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

### FCC statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.