

//control.Node

PS-3232

Introduction

The //control.Node is a programmable controller that can power and control a variety of accessories, such as motors, fans, and electromagnets. The sensor port on the //control.Node provides a way to input sensor signals for sense and control. The device can be connected to PASCO Capstone or SPARKvue via micro USB or Bluetooth and can be programmed using the Blockly visual coding language.

Components

Included components:

- //control.Node
- Micro USB cable

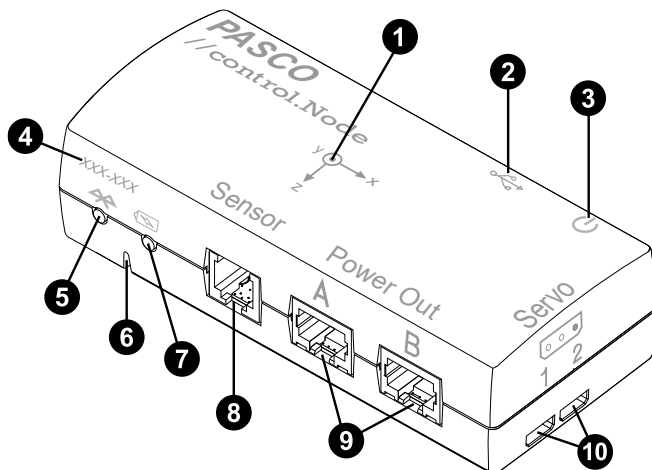
Required software:

- PASCO Capstone or SPARKvue data collection software

Accessories:

- High Speed Stepper Motor (PS-2976)
- Low Speed Stepper Motor (PS-2978)
- PASCObot without //control.Node (PS-2995)
- PASCObot Line Follower Module (PS-3320)
- PASCObot Range Finder Module (PS-3321)
- Greenhouse Sensor (PS-3322)
- Power Output Module (PS-3324)
- //control.Node Voltage Sensor (PS-3349)
- Limit Switch (PS-3351)
- Servo Motor (SE-2975)
- Continuous Rotation Servo (SE-2977)

Features



1 Accelerometer

Use to measure acceleration along three axes.

2 Micro USB port

Use to connect the //control.Node to a USB charger, or to make a wired connection to a computer, via the included cable.

3 Power button

Press and briefly hold to turn the sensor on or off. This button is also used to start execution of uploaded code.

4 Device ID

Use to identify the sensor when connecting via Bluetooth.

5 Bluetooth Status LED

Indicates the status of the Bluetooth connection and whether uploaded code is running.

LED	Status
Red blink	Ready to pair
Green blink	Paired
Blue blink	Running uploaded code

6 Speaker

Can be used to play sounds at specified frequencies.

7 Battery Status LED

Indicates the charging status of the //control.Node's battery.

LED	Status
Red blink	Low battery
Yellow ON	Charging
Green ON	Fully charged

8 Sensor port

Use to connect the //control.Node to compatible sensor accessories.

9 Power Out ports

Use to connect the //control.Node to stepper motors or certain other accessories.

10 Servo ports

Use to connect the //control.Node to servo motors.

11 Mounting holes (on bottom; not pictured)

Use to mount the //control.Node to various objects. Accepts #6-32 screws.

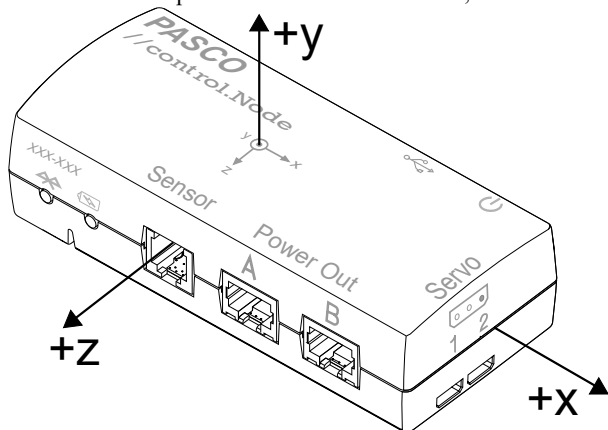
Sense and control elements

The //control.Node's outputs are controlled with blocks provided in the **Code** tool in PASCO Capstone or SPARKvue. Readings from any PASCO sensor can be used to control devices connected to the outputs using the **value of** block in the Code tool. In addition to using external sensors, there are specific sensors that can be plugged into the Sensor Port on the //control.Node.

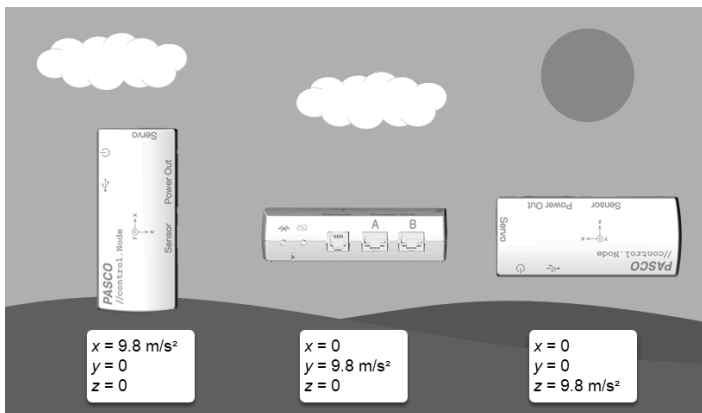
NOTE: Only devices with flat cables should be connected to the sensor port and the power output ports. Rounded cables may cause cross-talk that interferes with performance or data collection.

Accelerometer

The accelerometer is used to measure acceleration along three axes. The label on the top surface of the device indicates the position of the accelerometer and the positive direction of each axis, as shown below.



If the //control.Node is at rest, the accelerometer measures $+9.8 \text{ m/s}^2$ in one of its axes when that axis is pointing *away* from the ground and measures -9.8 m/s^2 when that axis is pointing *towards* the ground. You can use these measurements to determine the device's orientation. For example, if the y-axis is pointing away from the ground, the **Acceleration - y** measurement will read as 9.8 m/s^2 and the other two acceleration measurements will be zero. The figure below shows the expected readings of three positive orientations.



Speaker

You can use the speaker to output a sound at a specified frequency. Control the speaker frequency using the **set frequency** block.

Sensor port

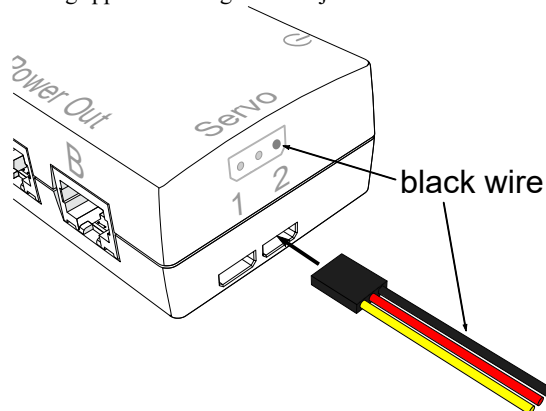
This port is used to connect certain sensors to the //control.Node, allowing their measurements to be recorded by the program during code execution. Compatible sensors include the PASCO Line Follower Module (PS-3320), the PASCO Range Finder Module (PS-3321), the Greenhouse Sensor (PS-3322), and the //control.Node Voltage Sensor (PS-3349).

Power Out ports

These ports are used to connect a High Speed Stepper Motor (PS-2976), Low Speed Stepper Motor (PS-2978), Power Output Board (PS-3324), or PASCO Grow Light (PS-3347) to the //control.Node. The software automatically identifies these accessories when they are plugged into the //control.Node. Each accessory can be controlled in Blockly with a block designed specifically for that accessory.

Servo ports

These ports can be used to connect a Servo Motor (SE-2975), Continuous Rotation Servo (SE-2977), or other third party servo to the //control.Node. Servos can be controlled with the **set servo** block. When connecting a servo, you must connect them with the black wire on the *right* side, as indicated by the dark dot on the label (see below). The //control.Node measures the current drawn by the servo, which allows the user to know when the servo is encountering a load, such as when a robot gripper is closing on an object.



Getting started

Initial step: Charge the battery

Charge the battery by connecting the micro USB port to any standard USB charger. The Battery Status LED is solid yellow while charging. When fully charged, the LED changes to solid green.

Get the software

You can use the //control.Node with SPARKvue or PASCO Capstone software. If you're not sure which to use, visit [pasco.com/products/guides/software-comparison](https://www.pasco.com/products/guides/software-comparison).

SPARKvue is available as a free app for Chromebook, iOS, and Android devices. We offer a free trial of SPARKvue and Capstone for Windows and Mac. To get the software, go to [pasco.com/downloads](https://www.pasco.com/downloads) or search for **SPARKvue** in your device's app store.

If you have installed the software previously, check that you have the latest update:

SPARKvue: Main Menu > Check for Updates

PASCO Capstone: Help > Check for Updates

Check for a firmware update

SPARKvue

1. Press the power button until the LEDs turn on.
2. Open SPARKvue. Select **Sensor Data** on the Welcome Screen.



3. From the list of available devices, select the device that matches your //control.Node's device ID.
4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
5. Close SPARKvue once the update is complete.

PASCO Capstone

1. Press the power button until the LEDs turn on.
2. Open PASCO Capstone and click **Hardware Setup**  from the Tools palette.
3. From the list of available devices, select the device that matches your //control.Node's device ID.
4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
5. Close Capstone once the update is complete.

Set up the software

SPARKvue

Connect the //control.Node via Bluetooth:

1. Press and hold the power button until the Bluetooth Status LED blinks red.
2. Start SPARKvue. Select **Sensor Data** on the Welcome Screen.
3. In the list of available wireless devices, select the //control.Node that matches the device ID printed on your device.

Connect the //control.Node via micro USB:

1. Start SPARKvue. Select **Sensor Data** on the Welcome Screen.
2. Using the included micro USB cable, connect the micro USB port on the //control.Node to a USB port or powered USB hub connected to your computer. SPARKvue will automatically detect and recognize the //control.Node, and the device will automatically turn on.

Set up data collection:

1. In the **Select measurements for templates** column, check the boxes for all measurements you will be observing during your experiment.
2. Select a template from the **Templates** column to open the Experiment Screen.

PASCO Capstone

Connect the //control.Node via Bluetooth:

1. Press and hold the power button until the Bluetooth Status LED blinks red.
2. Start Capstone, then select **Hardware Setup**  from the Tools palette.
3. In the list of available wireless devices, select the //control.Node that matches the device ID printed on your device.

Connect the //control.Node via micro USB:

1. Start Capstone. If desired, select **Hardware Setup**  from the Tools palette to check your connection status.
2. Using the included micro USB cable, connect the micro USB port on the //control.Node to a USB port or powered USB hub connected to your computer. Capstone will automatically detect and recognize the //control.Node, and the device will automatically turn on.

Set up data collection:

1. Select **Hardware Setup**  again to close the tool.
2. Create an appropriate display for your experiment by selecting its icon in the **Displays** palette on the right, then assign appropriate measurements to this display. For more information on setting up displays, see the PASCO Capstone online help.

Create a program

To create a program using Blockly, start by opening the **Code** tool in PASCO Capstone or SPARKvue. You can either build a new program from scratch or import a premade program from the PASCO Code Library available in the code workspace.



NOTE: It is also possible to upload code to the //control.Node, allowing the code to be run even after the device is disconnected from the program. For more information on this, see the PASCO Capstone or SPARKvue online help.

To build a new program, select a category in the Blockly toolbox and drag blocks from that category into the workspace. The **Hardware** category contains the sense and control blocks for the //control.Node.

To import a program from the PASCO Code Library:

1. At the top right corner of the code workspace, select the **PASCO Code Library**  icon.
2. Select a category from the list.
3. Select a program to import, then click **OK**.

To run the program, click **Execute** in the code workspace, or close the code workspace and click **Start**  (in SPARKvue) or **Record**  (in Capstone). For more information on creating code with Blockly, see the PASCO Capstone or SPARKvue online help.

Software help

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

SPARKvue

Software: Main Menu > Help

Online: help.pasco.com/sparkvue

PASCO Capstone

Software: Help > PASCO Capstone Help

Online: help.pasco.com/capstone

Specifications and accessories

Visit the product page at pasco.com/product/PS-3232 to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

Experiment files

Download one of several student-ready activities from the PASCO Experiment Library. Experiments include student handouts and teacher notes. Visit pasco.com/freelabs/PS-3232.

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
-  Phone 1-800-772-8700 x1004 (USA)
+1 916 462 8384 (outside USA)
-  Email support@pasco.com

Limited warranty

For a description of the product warranty, see the Warranty and Returns page at 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.

Battery disposal



Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative. The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.