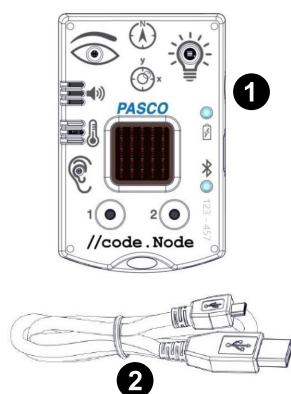


# //code.Node (PS-3231)



## Included Equipment

- 1 //code.Node
- 2 Micro USB cable

For connecting the sensor to a USB charger to charge the battery or a USB port to transmit data.

## Required Equipment

PASCO Capstone or SPARKvue software is required for data collection.

## Overview

The //code.Node is an input-output device that supports coding activities to help teach how sensors work and how code can be used to create and control a response (output) to a stimulus (input). The //code.Node is an introductory device for STEM-oriented programming activities performed using PASCO software applications. The device contains five sensors and two momentary push buttons that act as inputs, as well as three output signals, enabling students to program how the device collects and responds to data.

The //code.Node can sense relative light brightness, relative sound loudness, temperature, acceleration, tilt angle, and magnetic field. These input sensors are included to help teaching coding concepts and highlight how collected data can be analyzed and programmed to create unique outputs involving its speaker, LED light source, and 5 x 5 LED array. The //code.Node outputs are not exclusive for use only with its inputs; the outputs can be used in code involving any PASCO sensors and interfaces.

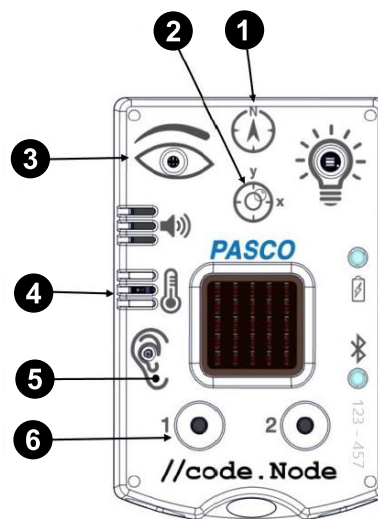


**NOTE:** All //code.Node sensors used in a given experiment will take measurements at the same sample rate specified in PASCO Capstone or SPARKvue. It is not possible to set separate sample rates for different sensors on the same //code.Node in a single experiment.

The //code.Node sensors are meant to be used for coding purposes and should not be considered a replacement for science sensors in labs that use similar sensor measurements. Sensors built to more rigorous specifications for use in science experiments are available at [www.pasco.com](http://www.pasco.com).

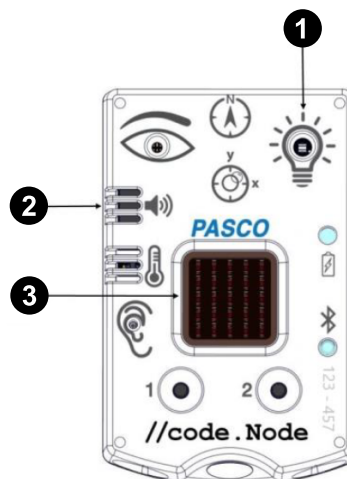
## Components

### Inputs



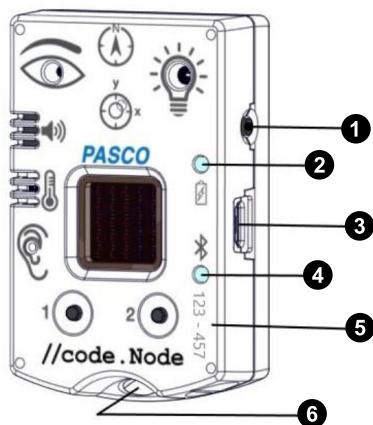
- 1 Magnetic Field Sensor
- 2 Acceleration and Tilt Sensor
- 3 Light Sensor
- 4 Ambient Temperature Sensor
- 5 Sound Sensor
- 6 Button 1 and Button 2

### Outputs



- 1 Red-Green-Blue (RGB) LED
- 2 Speaker
- 3 5 x 5 LED Array

## Sensor Components



### 1 Power Button

Press and hold for one second to turn on or off.

### 2 Battery status LED

Red blink	Battery needs to be recharged soon.
Green solid	Battery is fully charged.
Yellow solid	Battery is charging.

### 3 Micro USB port

For charging the battery when connected to a USB charger.  
For transmitting data when connected to the USB port of a computer.

### 4 Bluetooth status LED

Red blink	Ready to be paired with software
Green blink	Paired with software

### 5 Sensor ID

Use this ID when connecting the sensor to software.

### 6 Lanyard Hole

For attaching a lanyard, string, or other material.

## //code.Node Inputs

### Temperature/Light/Sound Sensor

This 3-in-1 sensor records ambient temperature, brightness as a measure of relative light intensity, and loudness as a measure of relative sound level.

- The temperature sensor measures ambient temperature between 0 — 40 °C.
- The light sensor measures brightness on a 0 — 100% scale, where 0% is a dark room and 100% is a sunny day.
- The sound sensor measures loudness on a 0 — 100% scale, where 0% is background noise (40 dBC) and 100% is a very, very loud scream (~120 dBC).



**NOTE:** The Temperature, Light, and Sound Sensors are not calibrated and cannot be calibrated within PASCO software.

## Magnetic Field Sensor

The magnetic field sensor only measures the strength of a magnetic field in the y-axis. A positive strength is produced when the north pole of a magnet is moved towards the "N" in the magnetic sensor icon on the //code.Node.

While the magnetic field sensor cannot be calibrated in the software application, the sensor measurement can be tared to zero.

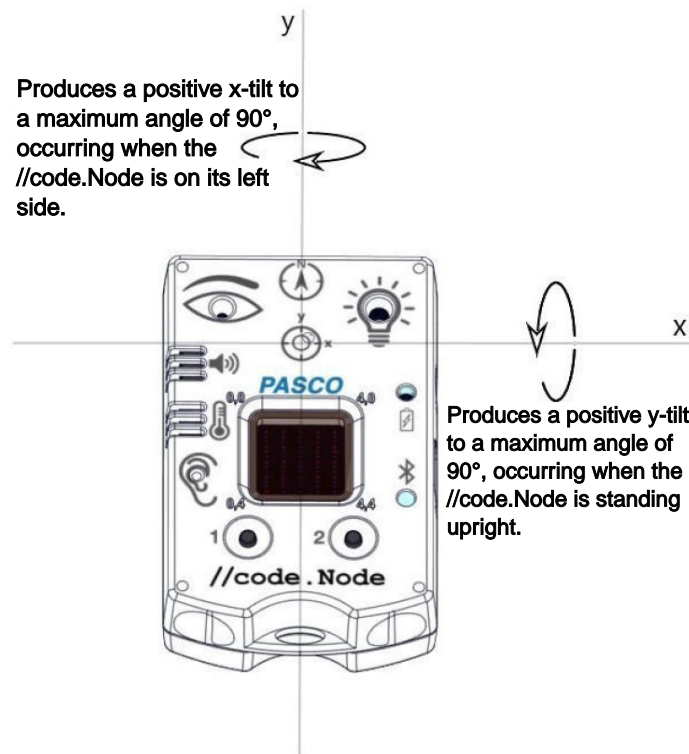
### Button 1 and Button 2

Button 1 and Button 2 are included as basic momentary inputs. When a button is pressed, that button will be assigned a value of 1. A value of 0 is assigned when the button is not being pressed.

## Acceleration and Tilt Sensor

The acceleration sensor within the //code.Node measures acceleration in the x- and y-axis directions, which are labeled on the sensor icon shown on the device. The pitch (rotation around the y-axis) and roll (rotation around the x-axis) are measured as Tilt Angle - x and Tilt Angle - y respectively; the tilt angle is measured to a  $\pm 90^\circ$  angle in relation to the horizontal and vertical planes.

The acceleration and tilt angle measurements of the sensor can be tared to zero from within the software application.



When placed face-up on a flat surface, tilting the //code.Node to the left (thus rotating around the y-axis) will result in a positive x-acceleration and a positive x- tilt angle up to  $90^\circ$ . Tilting to the right will result in a negative x- acceleration and negative x- tilt angle. Similarly, tilting the device upwards (rotating around the x-axis) will result in a positive y- acceleration and positive y- tilt angle to a maximum angle of  $90^\circ$ ; tilting the device downwards will produce negative values.

## //code.Node Outputs

Within the Blockly-integrated Code tool, unique coding blocks have been created in SPARKvue and PASCO Capstone for each output of the //code.Node to program and control their effects.



**NOTE:** The use of the //code.Node outputs are not exclusive to its inputs. These outputs can be used in conjunction with all lines of supported PASCO sensors.

### Accessing and using the Code Blocks for the //code.Node

Note that producing code for the //code.Node requires using PASCO Capstone version 2.1.0 or later or SPARKvue version 4.4.0 or later.

1. Open the software and select **Hardware Setup** from the Tools panel on the left (Capstone) or **Sensor Data** from the Welcome Screen (SPARKvue).
2. Connect the //code.Node to the device.
3. *SPARKvue only:* Once the //code.Node measurements appear, select the measurement options you intend to use, then select a template option.
4. Select **Code** from the Tools tab (Capstone), or click the **Code** button on the bottom toolbar (SPARKvue).
5. Select "Hardware" from the list of Blockly categories.

### RGB LED

One output signal of the //code.Node is its Red-Green-Blue (RGB) multi-color LED. The individual brightness levels for red, green, and blue light of the LED can be adjusted from 0 — 10, allowing for a spectrum of colors to be created.

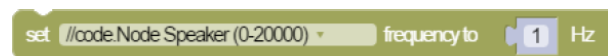
A single block is included in Code for the RGB LED and can be found in the "Hardware" Blockly category. A brightness of 0 for a given color will ensure that color LED is not emitted.



### Speaker

While the volume is fixed, the frequency of the //code.Node Speaker can be adjusted using the appropriate Code blocks. The speaker can generate sounds in a range of 0 — 20,000 Hz.

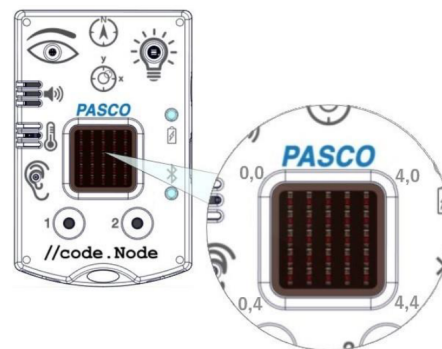
Two unique blocks are included in the software's Code tool to support the speaker output. The first of these blocks turns the speaker on or off; the second block sets the frequency of the speaker.



### 5 x 5 LED Array

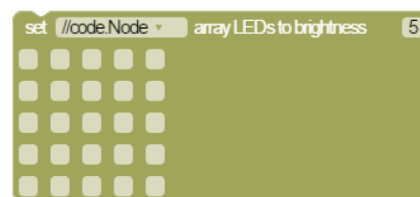
The central output of the //code.Node is a 5 x 5 array consisting of 25 red LEDs. The LEDs in the array are positioned using the (x,y) Cartesian coordinate system, with (0,0) at the top left corner and (4,4) at the lower right corner. A faint imprint of the

corner coordinates can be found at each corner of the 5 x 5 LED Array on the //code.Node.



The LEDs in the array can be turned on individually or as a set. The brightness of the LEDs is adjustable on a scale of 0 — 10, where a value of 0 will turn the LED off.

Three unique blocks are included in the software's Code tool that support the 5 x 5 LED Array. The first block sets the brightness of a single LED at a specified coordinate. The second block will set a group of LEDs to a specified brightness level and can be programmed to keep or clear previous code commands concerning the 5 x 5 LED array. The third block is an imitation of the 5 x 5 array on the //code.Node; checking a square is equivalent to setting the LED at that position on the //code.Node array to the specified brightness. Multiple squares can be selected.



## Using the sensor for the first time

Before using the sensor in the classroom, the following tasks must be completed: (1) **charge the battery**, (2) **install the latest version of PASCO Capstone or SPARKvue**, and (3) **update the sensor firmware**. Installing the latest version of the data collection software and the sensor firmware is necessary to have access to the latest features and bug fixes. Detailed instructions for each procedure have been provided.

### Charge the battery

The sensor contains a rechargeable battery. A fully charged battery will last an entire school day. To charge the battery:

1. Connect the micro USB cable to the micro USB port located on the sensor.
2. Connect the other end of the cable to a USB charger.
3. Connect the USB charger to a power outlet.

As the device is charging, the battery indicator light will be yellow. The device is fully charged when the light is green.

## Install the latest version of PASCO Capstone or SPARKvue

Follow the instructions below for your device to download and install the latest version of PASCO Capstone or SPARKvue.



### Windows and macOS

Go to [www.pasco.com/downloads/sparkvue](http://www.pasco.com/downloads/sparkvue) to access the installer for the latest version of SPARKvue.

### iOS, Android, and Chromebook

Search for "SPARKvue" in the App Store (iOS), Google Play Store (Android), or Chrome Web Store (Chromebook).



### Windows and macOS

Go to [www.pasco.com/downloads/capstone](http://www.pasco.com/downloads/capstone) to access the installer for the latest version of Capstone.

## Connect the sensor to PASCO Capstone or SPARKvue

The sensor can be connected to Capstone or SPARKvue using a USB or Bluetooth connection.

### To connect using USB:

1. Connect the micro USB cable to the sensor's micro USB port.
2. Connect the other end of the cable to your device.
3. Open Capstone or SPARKvue. The //code.Node will automatically connect to the software.



**NOTE:** Connecting to SPARKvue using USB is not possible with iOS devices and some Android devices.

### To connect using Bluetooth:

1. Turn on the sensor by pressing and holding the power button for one second.
2. Open SPARKvue or Capstone.
3. Click **Sensor Data** (SPARKvue) or **Hardware Setup** in the Tools panel on the left side of the screen (Capstone).
4. Click the wireless sensor that matches the ID label on your sensor.

## Update the sensor firmware

Sensor firmware is installed using SPARKvue or PASCO Capstone. You must install the latest version of SPARKvue or Capstone in order to have access to the latest version of the sensor firmware. When you connect the sensor to SPARKvue or Capstone, you will automatically be notified if a firmware update is available. Click "Yes" to update the firmware when prompted. If you do not receive a notification, the firmware is up to date.



**TIP:** Connect the sensor using USB for a faster firmware update.

## Specifications and accessories

Visit the product page at [pasco.com/product/PS-3231](http://pasco.com/product/PS-3231) 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 editable student handouts and teacher notes. Visit [pasco.com/freelabs/PS-3231](http://pasco.com/freelabs/PS-3231).

## 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	<a href="http://pasco.com">pasco.com</a>
Phone	1-800-772-8700 x1004 (USA) +1 916 462 8384 (outside USA)
Email	<a href="mailto:support@pasco.com">support@pasco.com</a>

### 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.

### 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.