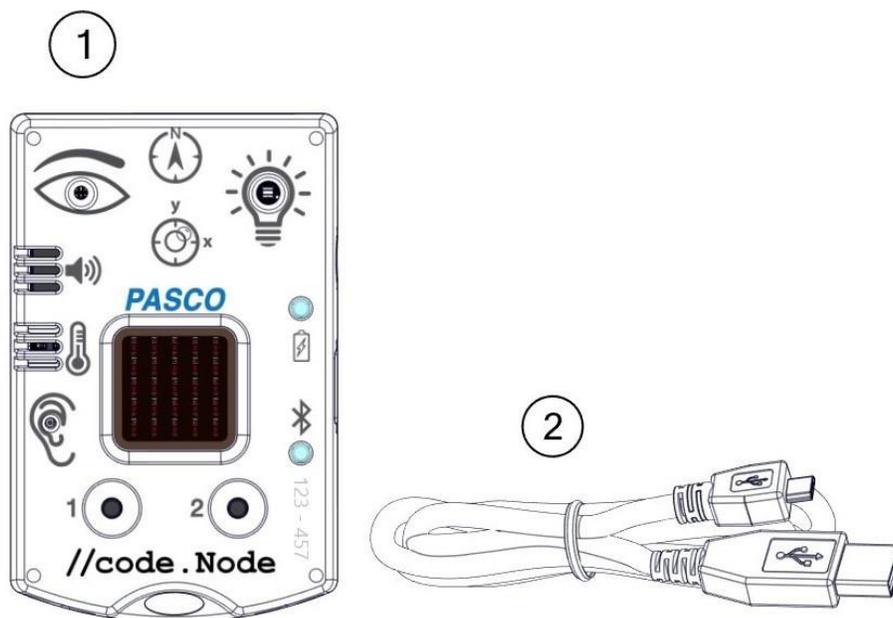# //code.Node

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 teach 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.

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; science sensors built to more rigorous specifications for use in science experiments are available at www.pasco.com.
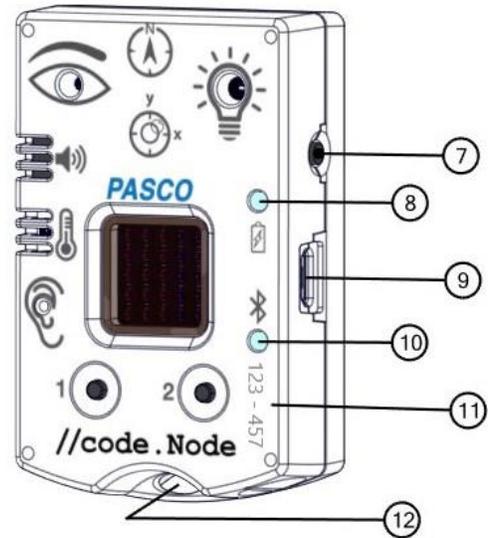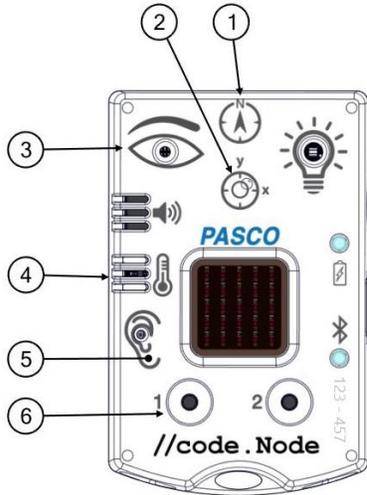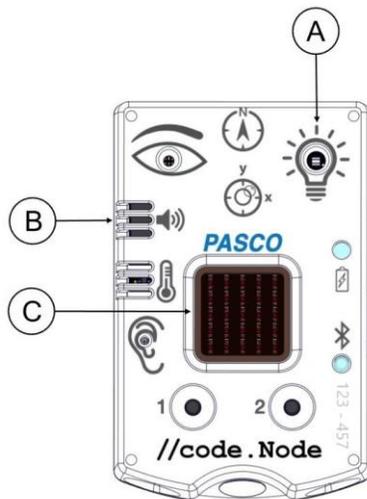
INPUTS

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

OUTPUTS

A	Red-Green-Blue (RGB) LED
B	Speaker
C	5 x 5 LED Array

SENSOR COMPONENTS

7   Power button

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

8   Battery status LED

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

9   Micro USB port

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

10   Bluetooth status LED

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

11   Sensor ID

Use this ID when connecting the sensor to software.

12   Lanyard Hole

For attaching a lanyard, string, or other material.

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//code.Node Inputs

Temperature/Light/Sound Sensor

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

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% 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).

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 it moved towards the "N" in the magnetic field 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. While pressed the Button will be assigned a value of 1. A value of 0 is assigned when the button is not being pressed.

Acceleration Sensor and Tilt

The acceleration sensor within the //code.Node measures acceleration in the x- and y- axis directions, which are labelled 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 ± 90° 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
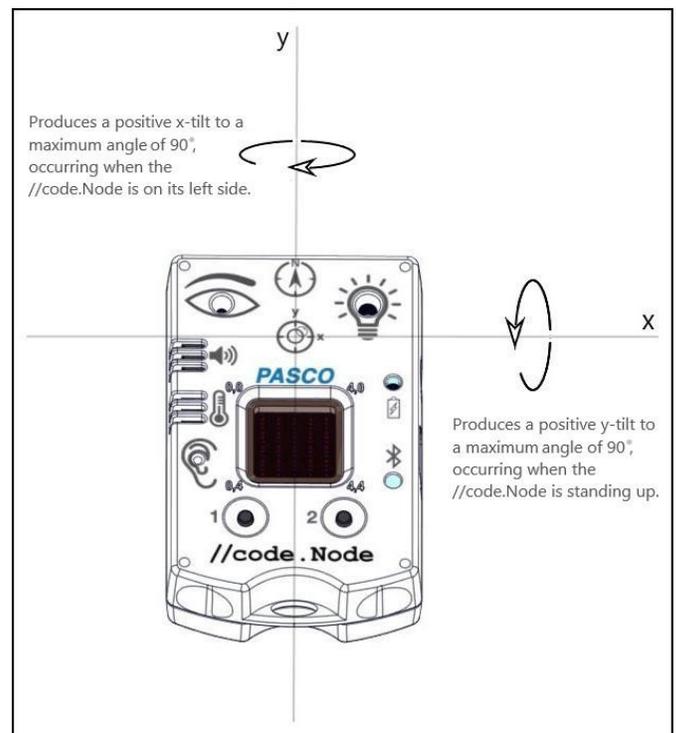
When placed face-up on a flat surface, tilting the //code.Node left (thus rotating around the y-axis) will result in a positive x- acceleration and a positive x- tilt angle up to 90°. Tilting to the right will result in a negative x- acceleration and negative x- tilt angle. Similarly, tilting the device upwards (rotating around the x axis) will result in a positive y- acceleration and positive y- tilt angle to a max angle of 90°; tilting the device downwards will produce negative values.

PASCO

//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.

To access and use the Code Blocks for the //code.Node:

PASCO capstone™ (Must be version 2.1.0 or later)

1. Open PASCO Capstone and select Hardware Setup from the Tools panel on the left.
2. Connect the //code.Node to the computer.
3. On the Tools tab, select Code.
4. Select "Hardware" from the list of Blockly Categories.

SPARKvue® (Must be version 4.4.0 or later)

1. Open SPARKvue and select Sensor Data from the Welcome Screen.
2. Connect the //code.Node to the device.
3. Once the //code.Node measurements appear, select a template option.
4. Click the Code button on the bottom toolbar.
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 (1) and can be found in the Hardware Blockly category. A brightness of '0' will ensure that that selected color LED is not emitted.
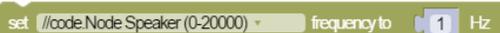

(1)

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 within a range of 0 – 20,000 Hz.
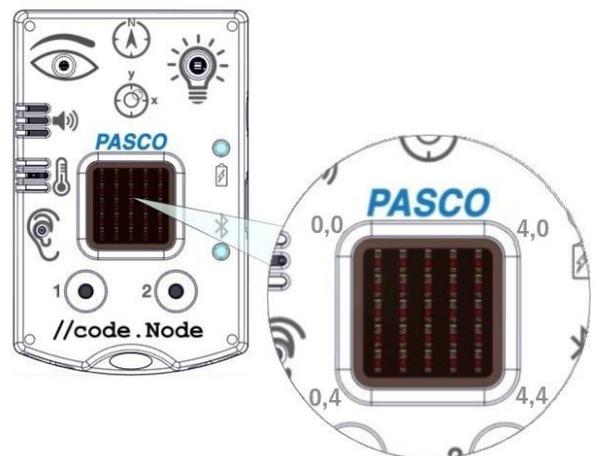
Two unique blocks are included in the software's Code tool to support the speaker output: one turns the speaker on or off (2) and one sets the frequency (3).

(2)

(3)

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 corners. 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. One block sets the brightness of a single LED at a specified coordinate (4). Another 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 (5). A third block is an imitation of the 5 x 5 array on the //code.Node (6); 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.

 (4)

 (5)

 (6)

Specifications of Sensors

//code.Node max sampling rate		50 Hz
Temperature	Range	0 – 40 °C
	Units	°C, °F, K
	Resolution	0.125 °C
	Accuracy	± 2 °C
Magnetic Field	Range	± 50 Gauss
Acceleration (x and y)	Range	± 8 g
Tilt Angle (x and y)	Range	± 90°

Experiments

Copy-ready experiment worksheets for classroom use are available on the PASCO website. Download the experiments for free at:
www.pasco.com/resources/lab-experiments

Technical Support

For assistance with PASCO products, contact PASCO at:

Address:	PASCO scientific
	10101 Foothills Blvd.
	Roseville, CA 95747-7100
Phone:	916-462-8384
Chat:	www.pasco.com
Email:	support@pasco.com

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.

Battery Disposal Instructions

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 International symbols to indicate the need for the separate collection and recycling of batteries.

FCC Statement

This Class A digital 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.

CE Statement

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

Warranty, Copyright, and Trademarks

Limited Warranty For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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PASCO

Using the sensor for the first time ⠿ SPARKvue®

The following instructions are intended for SPARKvue users. If you are using PASCO Capstone, follow the instructions on the opposite side of this page.

Before using the sensor in the classroom, do the following: (1) charge the battery, (2) install the latest version of SPARKvue, (3) update the sensor firmware. Installing the latest version of SPARKvue and sensor firmware is necessary to have access to the latest features and bug fixes. Detailed instructions for each procedure are provided below.

Update the sensor firmware

Sensor firmware is installed using SPARKvue. You must install the latest version of SPARKvue in order to have access to the latest version of the sensor firmware. When you connect the sensor to SPARKvue, 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.

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 USB cable to the 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 SPARKvue

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

Windows and macOS

Go to www.pasco.com/downloads/sparkvue then click Download Update.

iOS and Android

Search for SPARKvue in the App Store (iOS) or Google Play Store (Android).

Chromebook

Search for SPARKvue in the Chrome Web Store.

Connect the sensor to SPARKvue

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

> **Note**: Connecting using USB is not available with iOS devices and some Android devices.

To connect using USB:

1. Connect the USB cable to the USB port of the sensor.

2. Connect the other end of the cable to your device.

3. Open SPARKvue.

To connect using Bluetooth:

1. Turn on the sensor by pressing and holding the power button for one second.

2. Open SPARKvue.

3. Select Sensor Data.

4. Select the wireless sensor that matches the ID labeled on your sensor.

Using the sensor for the first time ◆ *PASCO* capstone™

The following instructions are intended for PASCO Capstone users. If you are using SPARKvue, follow the instructions on the opposite side of this page.

Before using the sensor in the classroom, do the following: (1) charge the battery, (2) install the latest version of Capstone, (3) update the sensor firmware. Installing the latest version of Capstone and the sensor firmware is necessary to have access to the latest features and bug fixes. Detailed instructions for each procedure are provided below.

Update the sensor firmware

Sensor firmware is installed using Capstone. You must install the latest version of Capstone in order to have access to the latest version of the sensor firmware. When you connect the sensor to 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.

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 USB cable to the 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

PASCO Capstone is available for computers running Windows or macOS. To download the latest version, go to www.pasco.com/downloads/capstone then click Download Update.

Connect the sensor to PASCO Capstone

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

To connect using USB:

1. Connect the USB cable to the USB port of the sensor.

2. Connect the other end of the cable to your device.

3. Open Capstone.

To connect using Bluetooth:

1. Turn on the sensor by pressing and holding the power button for one second.

2. Open Capstone.

3. Click Hardware Setup in the Tools panel on the left side of the screen.

4. Click the wireless sensor that matches the ID labeled on your sensor.