ScienceCube

Wireless Smart Cart (WL110SC)

User Guide

Rev. WL110SC-12-2023

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

KOREADIGITAL

The Science Cube wireless smart cart can be used for a variety of mechanical experiments on machine tracks or flat surfaces.

The wireless smart cart can be used for a variety of mechanical experiments on machine tracks or flat surfaces. As the magnet connected to the wheel rotates, the rotation angle can be used to measure the distance the cart moves. Additionally, it has built-in force sensors, acceleration, and angular velocity sensors, allowing for various dynamic experiments.

Magnetic rotation sensor capable of determining position, 3-axis acceleration, 100N force sensor that can measure push and pull forces, The wireless cart is equipped with a top for placing weights (weights not included), a rubber bumper to measure the amount of impact, and low-friction wheels for constant speed movement, allowing for a variety of experiments.

You can measure by remotely connecting to a smart device or PC wirelessly or wired.

Suggested experiments

- Measurement of speed and acceleration of objects
- Measurement of 3-axis angular velocity of an object
- Measurement of 3-axis acceleration of an object
- Measurement of momentum and impulse

Composition

The ScienceCube wireless smart cart *consists of the following.*

- Wireless smart cart(WL110SC)
- Rubber Bumper
- Hook
- Magnet * 4EA (include in cart)

- USB-A/C cable
- Booklet

Feature

- Up to four Science Cube wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the **Science#** application.
- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.

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Function of wireless sensor

Structure

① Battery Status LED : The red LED lights up during charging.

② USB charging port : The cart charges via USB, but USB communication is not supported.

③ Bluetooth status LED : Blinks when Bluetooth is connected.

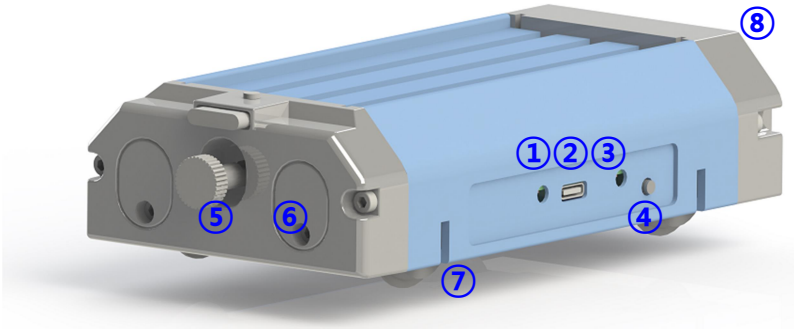
④ Power Button : It has functions such as power ON/OFF.

⑤ 3 positon Plunger

⑥ Magnetic tab : Used for attraction and repulsion between carts.

⑦ Built-in Wheel Magnetic encoder for position and velocity.

⑧ Bumper attachment : Attach bumpers or hooks.



Caution : For safety reasons, smart carts are designed to be secured to the suspension and not move when excessive loads are applied. It works the same way when you step on the cart with your foot.

How it Works

Distance

When you first connect the cart, the distance will be displayed and the speed will also be calculated and displayed. As the wheel rotates, the magnetic encoder wheel also rotates to change the distance value and calculate the speed value.

Force

If you choose the built-in sensor, you can choose 10N or 100N. Force sensors measure push and pull forces along the direction of movement of the cart. Use the hook attachment to pull and the bumper attachment to push. In Science#, pulling forces register as positive forces and pushing forces register as negative forces unless the

sensor readings are inverted. Do not subject the force sensor to strong shock. Permanent load cell damage may occur.

Acceleration

Select Acceleration from the built-in sensors to measure acceleration along three axes: X, Y, and Z. When selecting the icon, you can select ***g*** or **m/s²** units. Indicates the positive direction of each axis. The X direction of the acceleration is parallel to the pulling force of the force sensor, the Y direction is the lateral direction of the cart, and the Z direction is the vertical direction of the cart. Each XYZ acceleration direction can be activated and measured individually.

Gyroscope

Angular velocity is a vector that represents the speed at which an object is rotating. The direction of the angular velocity vector is always parallel to the axis of rotation. The magnitude of this vector is called the angular speed or rotational speed, and it is measured in **°/s** (radians per second) in the SI unit system. Angular velocity is usually denoted by the symbol omega (Ω or ω) [1]. The angular velocity is related to the speed of an object that is a certain distance away from the center of rotation. If the motion of an object takes place in a plane, the acceleration and the acceleration's direction are perpendicular.

Plunger

The cart includes a spring-loaded plunger for collisions. To use the plunger, push the plunger in by hand and lift slightly upward until the plunger locks. To release, press on the pin from the top of the cart. The plunger has grooves that hold it in two positions.

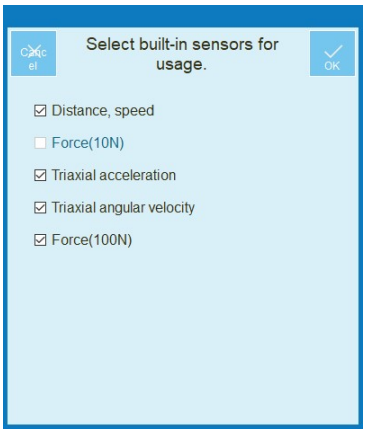
NOTE : Smart carts are multi-sensor, with sensors that can measure distance, force, acceleration, and angular velocity. All sensors can be used independently in Science# and cannot be used with other wireless sensors at the same time.

Using the Sensor

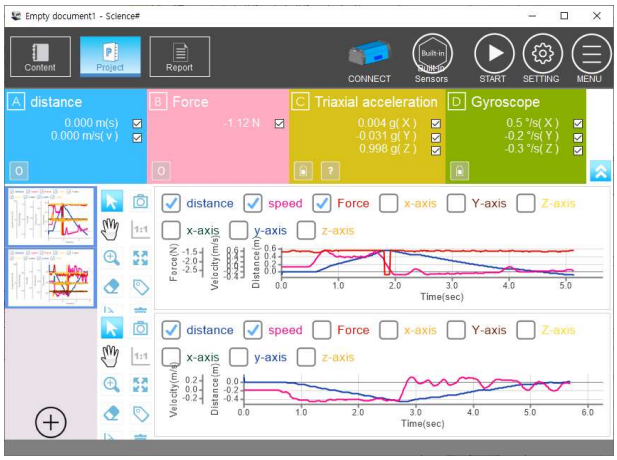
1. In the **Interface, Multi-Sensor** section, select **SmartCart** and click **Connect**.

2. When you press the **Built-in Sensors** icon in the menu, the sensor selection menu appears.

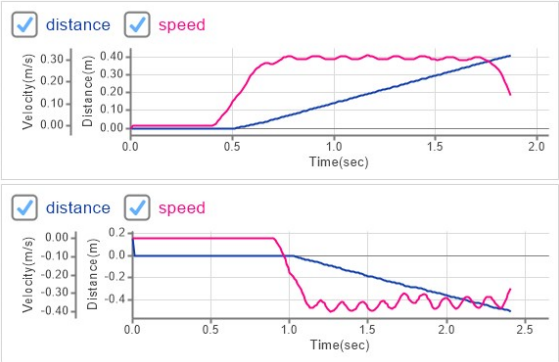
3. **Select built-in sensors** you want to use. 10N and 100N cannot be selected at the same time. You can only choose one of them.



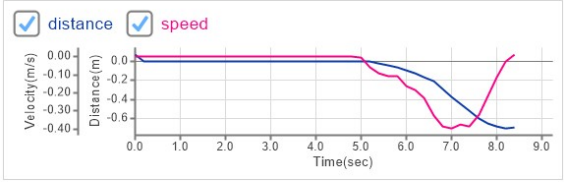
Experiment example screen

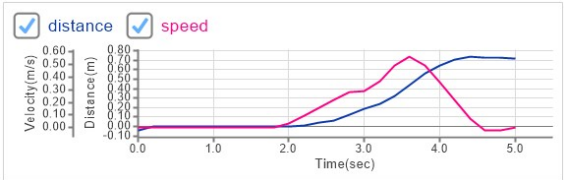


constant velocity motion



Acceleration/Deceleration Movement





Specifications

Item	Description
Range	Velocity : ±3 m/s Force : ±10 / ±100 N 3-axis acceleration : ±16 g 3-axis gyroscope : ±500 °/s
Resolution	Position : 0.5 mm Force : 0.01N / 0.1N Acceleration : 0.001 g Gyroscope : 0.1 °/s
Sampling Time	Max. 100Hz (0.01 sec.), (Typical 1Hz)
Condition	-20 ~ 60℃, 85%RH
Wireless Connection	Bluetooth 5.0 or Classic 2.1
Wired Connection	USB-C (Only charging, communication is not used)
Battery	1,000mAh Li-Polymer rechargeable
Charging Time	within 4 hours
Operating Time	Approximately 4 hours after full charge (depending on usage conditions)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301

CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

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Contact us

TEL : +82-2-2109-8839

FAX : +82-2-2109-8881

www.sciencecube.com

Korea Digital Co., Ltd.

#804 Ace Twin Tower 273 Digital-ro Guro-gu Seoul 08381 Korea

www.koreadigital.com