



TI-Innovator™ Hub with TI LaunchPad™ Board Setup Guide

This guidebook applies to TI-Innovator™ Hub software version 1.3. To obtain the latest version of the documentation, go to education.ti.com/go/download.

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Learning More with the TI-Innovator™ Technology eGuide

Parts of this document refer you to the TI-Innovator™ Technology eGuide for more details. The eGuide is a Web-based source of TI-Innovator™ information, including:

- Programming with the TI CE Family of Graphing Calculators and TI-Nspire™ Technology, including sample programs.
- Available I/O Modules and their commands.
- Available breadboard components and their commands.
- Available TI-Innovator™ Rover and its commands.
- Link to update the TI-Innovator™ Sketch software.
- Free classroom activities for TI-Innovator™ Hub.

<https://education.ti.com/go/eguide/hub/EN>



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TI-Innovator™ Hub Overview

The TI-Innovator™ Hub lets you use your compatible TI graphing calculator or TI-Nspire™ CX computer software to control components, read sensors, and create powerful learning experiences.

- You communicate with the Hub through TI Basic programming commands.
- Hosts that are compatible with TI-Innovator™ Hub include:
 - TI CE Family of Graphing Calculators (TI-83 Premium CE, TI-84 Plus CE, and TI-84 Plus CE-T) with operating system version 5.3 or later installed. You also need to install or update the Hub App, which contains the Hub menu.
 - TI Nspire™ CX or TI Nspire™ CX CAS handheld with operating system version 4.5 or later installed
 - TI Nspire™ computer software version 4.5 or later
- **TI-Innovator™ Hub.** Communicates with the host, the Hub on-board components, and connected external components. It also distributes power to external components.
- **TI-Innovator™ Components.** These components, sold separately, include sensors, motors, and LEDs that connect to the Hub through its I/O ports and breadboard connector.

Learn More

For a list of precautions to take while using the Hub and its components, refer to *General Precautions* (page 7).

To find information on accessories, external modules, and breadboard components, visit education.ti.com/go/innovator.

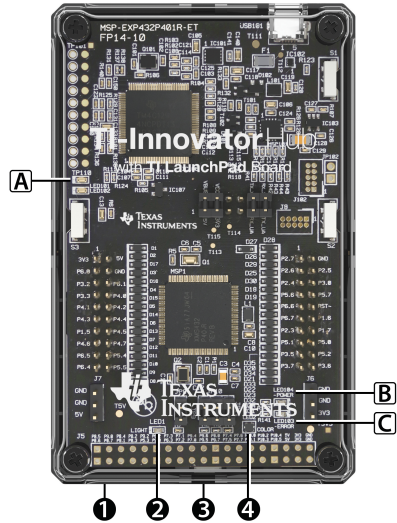
What's in the Box

TI-Innovator™ Hub with On-Board Components

- ❶ A Light Brightness Sensor at the bottom of the Hub can be read as "BRIGHTNESS" in Hub command strings.
- ❷ Red LED is addressable as "LIGHT" in Hub command strings.
- ❸ Speaker (at back of Hub, not shown) is addressable as "SOUND" in Hub command strings.
- ❹ Red-Green-Blue LED is addressable as "COLOR" in Hub command strings.

Also visible on the face of the Hub are:

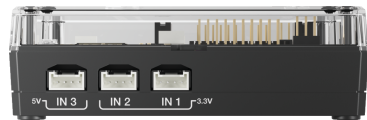
- A** Green auxiliary power LED
- B** Green power LED,
- C** Red error LED.



Built-in Ports

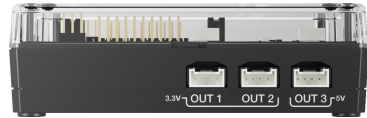
Left side - Three ports for collecting data or status from input modules:

- **IN 1** and **IN 2** provide 3.3V power.
- **IN 3** provides 5V power.



Right side - Three ports for controlling output modules:

- **OUT 1** and **OUT 2** provide 3.3V power.
- **OUT 3** provides 5V power.



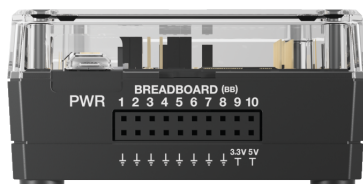
Bottom - Light Brightness Sensor (described earlier) and two ports:

- **I²C** port connects to peripherals that use the I²C communication protocol.
- **DATA** Mini-B port, used with the appropriate cable, connects to a compatible graphing calculator or computer for data and power.

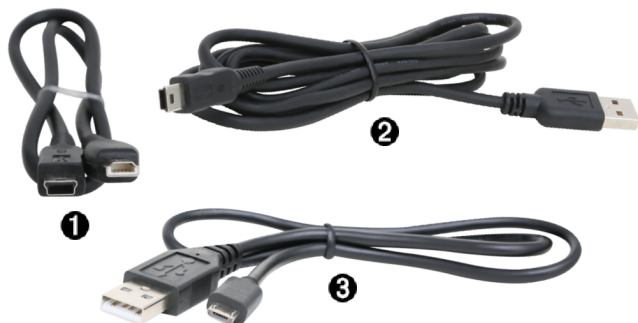


Top - Two connectors:

- USB-Micro connector (**PWR**) for auxiliary power required by some components. Also used for updating the Hub internal software.
- Breadboard Connector with 20 labeled pins for communication with connected components. A breadboard and jumper cables are included with the TI-Innovator™ Breadboard Pack, sold separately.



USB Cables



- ① USB Unit-to-Unit (Mini-A to Mini-B) - Connects the Hub to a TI CE Graphing Calculator or a TI-Nspire™ CX Handheld.
- ② USB Standard A to Mini-B - Connects the Hub to a computer running TI-Nspire™ CX Software.
- ③ USB Standard A to Micro - Connects the **PWR** port of the Hub to a TI approved power source required by some peripherals.

Auxiliary Power

TI Wall Charger - Supplies power through the TI-Innovator™ Hub for components, such as motors, that require additional power.

The optional External Battery Pack can also provide auxiliary power.

Note: An auxiliary power LED on the Hub indicates when the Hub is receiving auxiliary power.



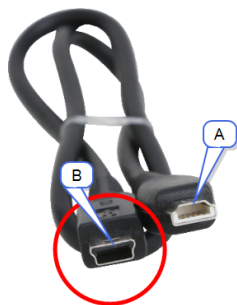
Connecting TI-Innovator™ Hub

The TI-Innovator™ Hub connects by a USB cable to a graphing calculator or computer. The connection lets the Hub receive power and exchange data with the host.

Note: Some peripherals, such as motors, may require auxiliary power. For more information, see Using an Auxiliary Power Source (page 6).

Connecting to a Graphing Calculator

1. Identify the "B" connector on the USB Unit-to-Unit (Mini-A to Mini-B) cable. Each end of this cable is embossed with a letter.
2. Insert the "B" connector into the **DATA** port at the bottom of the TI-Innovator™ Hub.



3. Insert the free end of the cable (the "A" connector) into the USB port on the calculator.



Hub connected to
TI CE Graphing Calculator



Hub connected to
TI-Nspire™ CX Handheld

4. Turn on the calculator if it is not already on.

The power LED on the Hub glows green to show that it is receiving power.

Connecting to a Computer Running TI-Nspire™ CX Software

1. Identify the "B" connector on the USB Standard A to Mini-B cable for Windows®/Mac®. Each end of this cable is embossed with a letter.
2. Insert the "B" connector into the **DATA** port at the bottom of the TI-Innovator™ Hub.
3. Insert the free end of the cable (the "A" connector) into a USB port on the computer.

The power LED on the Hub glows green to show that it is receiving power.



Using an Auxiliary Power Source

Normally, the TI-Innovator™ Hub and its connected components draw power from the host calculator or computer, through the **DATA** connector. Certain components, such as the optional Servo Motor, require more power than a calculator can provide reliably.

The **PWR** connector on the Hub lets you connect an auxiliary power source. You can use the TI Wall Charger or the External Battery Pack.

TI Wall Charger (included with the Hub)

- Plugs into a wall outlet.
- Does not use batteries.



External Battery Pack (sold separately)

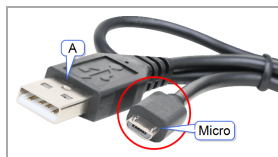
- Rechargeable.
- Has On/Off button with a row of LEDs that momentarily indicate the battery charge when you turn the battery on.
- Turns itself off after being disconnected from the Hub for about 3 minutes.



Note: To recharge the External Battery Pack, disconnect it from the Hub and then connect it to the TI Wall Charger using the USB Standard A to Micro cable. Do not use the External Battery Pack as an auxiliary power source while it is being charged.

Connecting the Power Source

1. Identify the Micro connector on the USB Standard A to Micro auxiliary power cable.
2. Insert the Micro connector into the **PWR** connector at the top of the Hub.



3. Insert the free end of the cable (the "A" connector) into the USB port on the power source.
4. Turn on the power source:
 - If using the TI Wall Charger, plug it into a wall socket.
 - If using the External Battery Pack, press the power button.

An auxiliary power LED on the Hub glows to show that the Hub is receiving auxiliary power.

5. Connect the TI-Innovator™ Hub to the host calculator, using the USB Standard A to Mini-B cable.
6. Connect the I/O Module or breadboard component to the Hub.

General Precautions

TI-Innovator™ Hub

- Do not expose the Hub to temperatures above 140°F (60°C).
- Do not disassemble or mistreat the Hub.
- Do not chain together multiple Hubs through the I/O ports or the Breadboard Connector.
- Use only the USB cables provided with the Hub.
- Use only the TI provided power supplies:
 - TI Wall Charger included with the TI-Innovator™ Hub
 - Optional External Battery Pack
 - 4AA battery holder included in the TI-Innovator™ Breadboard Pack
- Ensure that the components receiving power from the Hub do not exceed the Hub's 1-amp power limit.
- Avoid using the Hub to control AC electricity.

Breadboard Connector on the Hub

- Do not insert the leads of LEDs and other components directly into the Hub's Breadboard Connector. Assemble the components on the breadboard and use the provided jumper cables to connect the breadboard to the Hub.
- Do not connect the 5V receptacle pin on the Hub's Breadboard Connector to any of the other pins, especially the ground pins. Doing so could damage the Hub.
- Connecting the top row of receptacle pins (BB1-10) to the bottom row (grounding and power pins) is not recommended.
- No pin on the Hub's Breadboard Connector can sink or source greater than 4 mA.



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