FAQ

# BBC micro:bit connectivity with TI-Nspire™ CX II family products

Overview

In **February 2021**, version 5.3 calculator operating system (OS) and desktop software updates were released for **TI-Nspire™ CX II family products.** This update introduces OS and software enhancements that enable USB communication with a third-party microcontroller board called the **BBC micro:bit**.

With this update, Python programming with the micro:bit board can be enabled by a module that is available for download from the Texas Instruments (TI) website and installed on the TI-Nspire™ CX II graphing calculator and software.
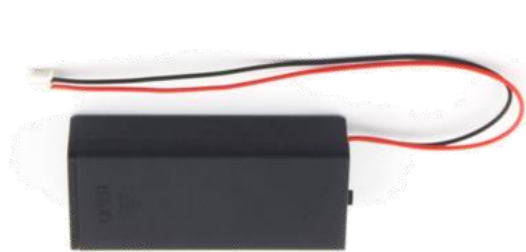
What is BBC micro:bit?

The BBC micro:bit is a pocket-sized microcontroller board that helps students learn how software and hardware work together. Per their site: "It has an LED light display, buttons, sensors and many input/output features that, when programmed, let it interact with you and your world."
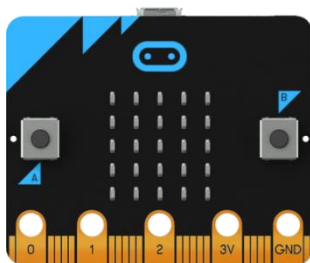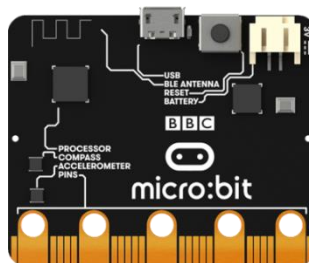
(Front)   (Back)   (Battery)

Globally, there are over **four million** micro:bit boards distributed across 60 countries with many hardware, content and education partners.

While the original micro:bit board is pictured above, there was a new micro:bit version 2, or V2, introduced and made available in November 2020. Key updates with the V2 board include a built-in speaker, a built-in microphone, a capacitive touch sensor, and more memory on board. For a comprehensive overview of the V2 board, visit microbit.org/new-microbit/.

TEXAS INSTRUMENTS

A typical micro:bit use scenario involves coding on a computer with drag-and-drop block code, Python code, or other coding languages, then "flashing" the resulting program onto the micro:bit board which is then disconnected and run while the micro:bit board is untethered from the computer but powered with the connected battery.

The TI solution enables interaction with BBC micro:bit while tethered to the calculator, enabling interaction not only with the micro:bit, but also with the calculator display and keypad.

Who is the intended audience for BBC micro:bit connectivity with TI-Nspire™ CX II family products?
Students and teachers in classrooms, schools, districts and other initiatives who use or plan to use micro:bit may see the most immediate value when used in conjunction with TI-Nspire™ CX II graphing calculators and software. This may include coding clubs and camps, STEM initiatives, computer science classes, math and science classes, and more.

How does the TI-Innovator™ Hub with TI LaunchPad™ Board differ from BBC micro:bit?
- The TI-Innovator™ Hub supports programs written in TI-Basic as well as Python.
- The TI-Innovator™ Hub has built-in ports for Grove sensor compatibility, while the micro:bit requires an extension board for connectivity.
- The TI-Innovator™ Hub has a plastic enclosure which offers a high degree of durability with student use.
- The TI-Innovator™ Hub is able to do advanced programming capabilities that are suited for students in middle school through high school.
- The TI-Innovator™ Hub's built-in ports remove the need to purchase extension boards for connectivity to plug-and play hardware modules.
- The micro:bit requires extension boards for connectivity to other hardware modules.

What TI programming language can I use on the TI-Nspire™ CX II graphing calculator with the BBC micro:bit?
- Python coding with the micro:bit is supported with a module authorized for installation and use with TI-Nspire™ CX II family products.
- There is no micro:bit programming support with TI-Basic.

How do I get started with BBC micro:bit and the TI-Nspire™ CX II graphing calculator?
Three key elements must be in place.

1) **A micro:bit module**. A micro:bit module must be installed on your TI-Nspire™ CX II graphing calculator or software. This supplies the Python programming functions needed to communicate with the micro:bit. When installed, a BBC micro:bit module selection appears at the bottom of the More Modules menu.
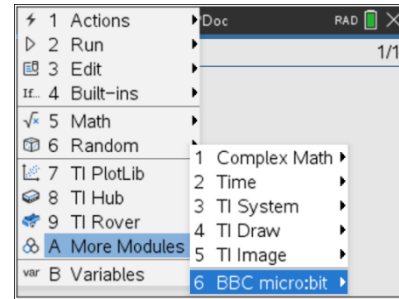
2) **A "TI runtime" hex file**. To enable programming the micro:bit with Python, a TI runtime file must be flashed onto the micro:bit board prior to use. This can be achieved by dragging and dropping the hex file onto the micro:bit file directory when the micro:bit is plugged into a computer, or by using an online micro:bit software utility (found at python.microbit.org/v/2.0). When successful, a Texas logo pattern will appear on the 5x5 LED display
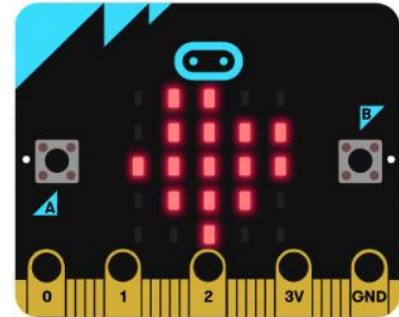
3) **A micro USB connection**. The micro:bit board is equipped with a USB micro-B female connector.
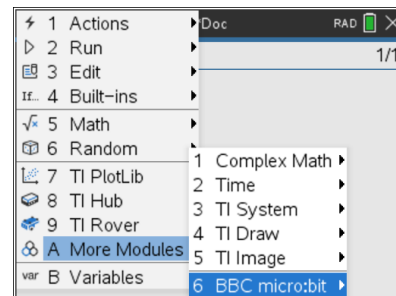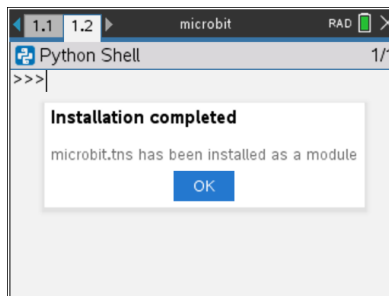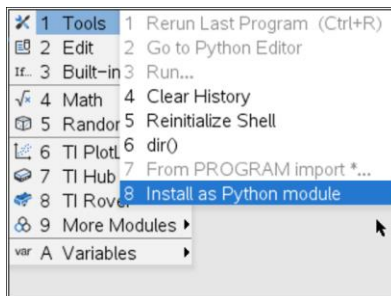
   TI-Nspire™ CX II graphing calculator connection with the micro:bit board can be achieved with a USB OTG mini to micro male cable.

   Communication with TI-Nspire™ CX computer software may be achieved with a USB type-A to micro-B cable.

How do I install the micro:bit module?
To simplify the process, the TI Python application includes an "Install as Python module" selection. Simply open the .tns file that includes the BBC micro:bit module and, under the Tools menu on the Shell page, select "Install as Python Module." When complete, the BBC micro:bit module is installed. When a new Python program is created, a BBC micro:bit module menu selection will appear at the bottom of the More Modules menu.

How does a module differ from a Python module that is already built into my TI-Nspire™ CX II graphing calculator?
While built-in functions and modules offer a consistent baseline of functionality, modules can be installed and deleted depending on teacher- and student-use scenarios. In this context, modules offer a high degree of flexibility to add specialized Python functions — in this case, functions designed to work with the BBC micro:bit. The ability to install and remove modules also adds flexibility with memory management.

Resources and support

What resources are available to help teachers and students get started?

1) **A micro:bit module webpage**
   This page highlights the micro:bit module and offers a location to download the necessary files. This page also offers direction to procure a cable, instructions for getting started, and links to getting started content like 10 Minutes of Code.

2) **10 Minutes of Code with micro:bit on the TI-Nspire™ CX II graphing calculator**
   This resource includes skill builders showing how to get started and how to write and run Python programs with the BBC micro:bit module in conjunction with other built-in Python functions and modules.

Where can I find support information for BBC micro:bit?
Please visit the BBC micro:bit website for inquiries about BBC micro:bit:
- https://microbit.org/
- https://support.microbit.org/support/home

What documentation is available to help me program with Python?
To learn the basics of programming with Python on the TI-Nspire™ CX II graphing calculator, visit TI Codes Python with TI-Nspire™ CX II technology.

For a comprehensive descriptions of Python coding APIs (Application Programming Interface), refer to Python and MicroPython documentation found online. Here are starting points:
- Python — https://docs.python.org
- MicroPython — http://docs.micropython.org

Can I use the TI micro:bit solution with content and activities that are written by other publishers?
Yes. Python functions implemented in the micro:bit module are applied in a way that align with the micro:bit Python API used with computer applications. As a result, a broad range of activities that use micro:bit Python functions can be coded with the TI micro:bit add-on module and executed with the micro:bit tethered to a TI-Nspire™ CX II graphing calculator.

Content from most any publisher that has Python coding activities for the micro:bit may make good starting points to identify engaging activities. One good starting point is the **Microbit Foundation** [website](#), where numerous projects, lessons and coding activities can be found.

Note: Activities that require micro:bit to run untethered (unplugged, stand-alone board with battery power) or untethered while plugged into other devices via the edge connector are not supported by the TI micro:bit solution at this time.

Functionality

What functionality does the micro:bit module support?
The micro:bit module will enable students and teachers to interact with an array of micro:bit functionality, including:
- **Displaying** image patterns and animations on the 5x5 LED matrix
- Playing **music** with a speaker connected (via alligator clip) to the edge connector on a V1 micro:bit board or through the built-in speaker on a V2 micro:bit board
- Interacting with **Buttons** A & B on both V1 and V2 micro:bit boards or with the **capacitive touch sensor** on V2 micro:bit boards
- Interacting with the built-in **compass**, **accelerometer**, **temperature sensor** and **light level sensor**
- Communicating through the edge-connector **Pins** to interact with digital and analog devices with **Input** (read) and **Output** (write) functions
- Transmitting and receiving **Radio** signals
- Interacting with **Grove sensors** via extension boards connected to the edge connector
- Connecting to, and interacting with, third-party **NeoPixel** LED strips (and the TI-RGB Array) connected via alligator clip to the edge connector

Note that **Bluetooth** (BLE) functions are not supported on V1 micro:bit boards. This is a general limitation with the Python API on any platform (TI calculators or computers) due to memory size limitations on the V1 micro:bit. The micro:bit V2 boards include a larger memory.

A comprehensive overview of the Python API for micro:bit can be found [here](#).

If you are interested in the micro:bit developer community, look [here](#) for deep technical insight and other insights on programming language support.

What is the difference between "tethered" and "untethered" use with micro:bit?
With computers, the typical use scenario is untethered. You first write a program on the computer then temporarily connect via a USB cable to "flash" the program to the micro:bit. You then unplug the micro:bit with the program running on the untethered micro:bit. When untethered, the micro:bit must be powered with a battery plugged into the micro:bit.

Connectivity with the TI-Nspire™ CX II graphing calculator enables students to run micro:bit programs while the micro:bit remains tethered to the calculator. While tethered, programs can be executed without the need for an external power source.

What are some advantages to using a (tethered) TI micro:bit solution?
- Interacting with BBC micro:bit while tethered to the calculator enables interaction not only with micro:bit, but also enables interaction with the calculator display and keypad in conjunction with micro:bit.
- While tethered to a TI-Nspire™ CX II graphing calculator, the handheld acts as the power source and eliminates the need to plug in the external battery while the calculator is turned on.
- Micro:bit with a connected TI-Nspire™ CX II graphing calculator is an extremely portable solution enabling students to take it home, use it on the bus, or interact with it in virtually any environment, anywhere, any time.
- The TI Python implementation is optimized for use with students who are new to programming. It offers in-line prompts, context help, color fonts and guided exploration through menu-driven function selections.

Software and operating system updates

How do I update my TI-Nspire™ CX II graphing calculator and software to work with the BBC micro:bit?
- Go here to download the latest version. To work with micro:bit, you need to have version 5.3 or above.
- After the OS and software update, proceed with "Getting Started" steps 1 through 3 to install the micro:bit module, flash the micro:bit "runtime" and procure the needed cable(s) or adapter(s) for connectivity.

Please note that the older model TI-Nspire™ CX graphing calculator does not support Python and therefore cannot be updated to support coding with micro:bit.

Graphing calculator and software compatibility

Which TI-Nspire™ CX II graphing calculator models and software will work with BBC micro:bit?

Calculators
- TI-Nspire™ CX II graphing calculator
- TI-Nspire™ CX II CAS graphing calculator

Computer software
- TI-Nspire™ CX Premium Teacher Software
- TI-Nspire™ CX Student Software
- TI-Nspire™ CX CAS Student Software

The older model TI-Nspire™ CX graphing calculator does not support Python and therefore does not support coding with micro:bit.

Press-to-Test

Is the BBC micro:bit module available when Press-to-Test is initiated on TI-Nspire™ CX II graphing calculators?
No. Modules are disabled when Press-to-Test is initiated. It is unlikely that connectivity with micro:bit will be necessary during an exam.

Purchase information

Where can I buy TI-Nspire™ CX II graphing calculators and software?
Through retailers and instructional products dealers who sell TI-Nspire™ CX II graphing calculators.

Where can I buy the BBC micro:bit?
Visit microbit.org for details on where to purchase.