



# Cheatsheet: Arduino Command Line

<b>General</b>	<b>2</b>
General Information	2
Resources	2
Core Platforms And Fully Qualified Board Names	2
<b>Arduino CLI Tool</b>	<b>4</b>
General Information	4
Resources	4
Command Line Usage	4
<b>Revisions</b>	<b>7</b>

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## General

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### General Information

- The original (legacy) *Arduino IDE* 1.x application provided the means to program and manage microcontroller boards from either the IDE GUI or from the command line. This dual capability was split into separate tools with the latest releases from Arduino. The *Arduino IDE* 2.x application now provides the graphical user interface and the *Arduino CLI* tool provides the command line interface. In actuality, the new IDE calls the *Arduino CLI* utility for most of its board management functions.

### Resources

- [Using The Arduino Command Line](#) article on [WoolseyWorkshop.com](#).
- [Quick Tip: Using The Screen Utility To View Arduino Serial Output](#) article on [WoolseyWorkshop.com](#).

### Core Platforms And Fully Qualified Board Names

- Core platforms (libraries) provide the necessary resources to utilize a specific category of boards within the Arduino ecosystem. They typically represent the vendors and microcontroller architectures of supported boards.
- Cores are installed in the *packages* directory for the following operating systems.
  - Windows: *C:\Users\<username>\AppData\Local\Arduino15\packages*
  - macOS: */Users/<username>/Library/Arduino15/packages*
  - Linux: */home/<username>/.arduino15/packages*
- The *boards.txt* files included within the core installations contain the names and configuration information for all of the boards supported for that particular core platform. They are located in the *<package>/hardware/<architecture>/<version>* folder for each core. For example, the *boards.txt* file for version 1.8.6 of the *Arduino AVR Boards* core library is located at the following location on a macOS based system.
  - */Users/<username>/Library/Arduino15/packages/arduino/hardware/avr/1.8.6/boards.txt*

- Fully Qualified Board Names (FQBN) are board identifiers used for specifying individual boards with the *Arduino CLI* command line interface tool.
- Syntax: core = <package>:<architecture> and fqbn = <core>:<board>, where
  - <package> = vendor identifier, typically arduino
  - <architecture> = microcontroller architecture, e.g., avr, megaavr, renesas\_uno, samd, etc.
  - <board> = board name defined within the core's *boards.txt* file, e.g., uno, uno2018, unor4wifi, nano, etc.
- FQBN Examples
  - arduino:avr:uno (Arduino Uno R3)
  - arduino:megaavr:uno2018 (Arduino Uno WiFi R2)
  - arduino:renesas\_uno:unor4wifi (Arduino Uno R4 WiFi)

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## Arduino CLI Tool

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### General Information

- The *Arduino CLI* tool is a command line utility used for developing, managing, and uploading sketches from the command line.
- In addition to being used as a stand alone command line program, the *Arduino CLI* tool is also the backend for the new *Arduino IDE 2*.
- Executable name: `arduino-cli`
- Current as of version 0.32.3 (06/30/2023).

### Resources

- Source, download, and documentation are available on [GitHub](#).
- [Hands-on with the Arduino CLI!](#) video tutorial by Arduino.

### Command Line Usage

- General syntax: `$ arduino-cli [<command>] [<options>] [<path>/<sketch>]`
- Get help.
  - Syntax: `$ arduino-cli`
  - Syntax: `$ arduino-cli help [<command>]`
  - Syntax: `$ arduino-cli [<command>] --help`
  - Example: `$ arduino-cli`
  - Example: `$ arduino-cli help board`
  - Example: `$ arduino-cli compile --help`
- Show the executable version.
  - `$ arduino-cli version`
- Update all core (platform) and library indexes.
  - `$ arduino-cli update`
- List all outdated cores and libraries that can be upgraded.
  - `$ arduino-cli outdated`
- Upgrade all outdated cores and libraries to their latest versions.
  - `$ arduino-cli upgrade`
- List the installed cores.
  - `$ arduino-cli core list`
- Upgrade the installed cores.
  - `$ arduino-cli core upgrade`

- Search for cores.
  - Syntax: `$ arduino-cli core search <search>`
  - Example: `$ arduino-cli core search arduino`
  - Example: `$ arduino-cli core search samd`
- Install a core (board platform).
  - Syntax: `$ arduino-cli core install <core>[@<version>]`
  - Example: `$ arduino-cli core install arduino:megaavr@1.8.6`
- List all supported boards.
  - `$ arduino-cli board listall`
- Discover connected board(s).
  - `$ arduino-cli board list`
- List a board's details.
  - Syntax: `$ arduino-cli board details -b <fqbn>[:parameters]`
  - Example: `$ arduino-cli board details -b arduino:megaavr:uno2018`
- List all installed libraries.
  - `$ arduino-cli lib list`
- Upgrade all installed libraries.
  - `$ arduino-cli lib upgrade`
- Search for libraries.
  - Syntax: `$ arduino-cli lib search <lib>`
  - Example: `$ arduino-cli lib search Madgwick`
- Install a library.
  - Syntax: `$ arduino-cli lib install <library>[@<version>]`
  - Example: `$ arduino-cli lib install Madgwick`
  - Example: `$ arduino-cli lib install ArduinoJson@6.16.0`
- List the example sketches included in the libraries.
  - Syntax: `$ arduino-cli lib examples [<lib>]`
  - Example: `$ arduino-cli lib examples ArduinoHttpClient`
- Create a new sketch.
  - Creates the sketch folder with the associated .ino file.
  - Syntax: `$ arduino-cli sketch new [path]<sketch>`
  - Example: `$ arduino-cli sketch new Blink`
- Archive a sketch to a zip file.
  - Syntax: `$ arduino-cli sketch archive [[path]<sketch>] [[path]<zip>]`
  - Example: `$ arduino-cli sketch archive ~/Arduino/Blink`
    - Archives the sketch and places the zip file one directory up from the sketch location.
  - Example: `$ arduino-cli sketch archive`
    - Executed from within the sketch directory.
    - Archives the sketch and places the zip file one directory up.

- Compile (verify) a sketch.
  - Syntax: `$ arduino-cli compile -b <fqbn>[:parameters] [<path>/<sketch>]`
  - Example: `$ arduino-cli compile -b arduino:avr:uno`
    - Executed from within the sketch directory.
  - Example: `$ arduino-cli compile -b arduino:megaavr:uno2018:mode=off ~/Documents/Arduino/Blink`
- Upload a sketch to a board.
  - Syntax: `$ arduino-cli upload -b <fqbn>[:parameters] -p <port> [<path>/<sketch>]`
  - Example: `$ arduino-cli upload -b arduino:avr:uno -p /dev/cu.usbserial-A6028SP5`
    - Executed from within the sketch directory.
  - Example: `$ arduino-cli upload -b arduino:megaavr:uno2018:mode=off -p /dev/cu.usbmodem14202 ~/Documents/Arduino/Blink`
- View the serial output from a connected board.
  - Syntax: `$ arduino-cli monitor -p <port> [-c <config>]`
  - Example: `$ arduino-cli monitor -p /dev/cu.usbmodem2102 -c baudrate=9600`
- Attach a specific sketch to a specific board.
  - Creates a `sketch.yaml` configuration file within the sketch directory.
  - Syntax: `$ arduino-cli board attach [-b <fqbn>] [-p <port>] [<path>/<sketch>]`
  - Example: `$ arduino-cli board attach -p /dev/cu.usbmodem14202`
    - Executed from within the sketch directory.
  - Example: `$ arduino-cli board attach -b arduino:megaavr:uno2018`
    - Executed from within the sketch directory.
  - Once a sketch is fully attached to a specific board, you can run simple commands like the following from within the sketch directory.
    - `$ arduino-cli compile`
    - `$ arduino-cli upload`
    - `$ arduino-cli compile -u`
      - Compiles and uploads the sketch in a single command.

## Revisions

Version	Date	Modifications
1.5	08/23/2023	<ul style="list-style-type: none"> <li>- Updated the FQBN information and added an example for the Arduino Uno R4 WiFi.</li> <li>- Removed the Arduino IDE 1.x (Legacy) section.</li> <li>- Removed information for the <i>screen</i> command.</li> <li>- Updated command line options with updated syntax for various commands.</li> <li>- Added the <i>arduino-cli monitor</i> command.</li> <li>- Other minor changes.</li> </ul>
1.4	01/21/2021	<ul style="list-style-type: none"> <li>- Fixed a few accidental issues with the 1.3 version.</li> </ul>
1.3	01/12/2021	<ul style="list-style-type: none"> <li>- Added descriptions for the Arduino IDE application and the <i>arduino-cli</i> tool.</li> <li>- Added optional version attribute to <i>arduino-cli core install</i> command.</li> <li>- Added <i>arduino-cli lib examples</i> and <i>sketch archive</i> commands.</li> <li>- Removed outdated items.</li> <li>- Updated text coloring and formatting.</li> <li>- Other minor changes.</li> </ul>
1.2	08/29/2020	<ul style="list-style-type: none"> <li>- Updated the Arduino CLI Tool section to add a video tutorial link, change the current version to 0.12.1, and add the new "outdated", "update", "upgrade", and "board attach" commands.</li> <li>- Added screen utility information along with a link to the Quick Tip: Using The Screen Utility To View Arduino Serial Output article.</li> <li>- Other minor wording changes for clarity.</li> </ul>
1.1	10/24/2019	<ul style="list-style-type: none"> <li>- Specified "classic" version of the Arduino IDE along with mentioning the new Pro version.</li> <li>- Added current version accuracy.</li> <li>- Added <i>arduino-cli core upgrade</i> command.</li> <li>- Updated <i>arduino-cli sketch new</i> command to reflect change from old default sketch directory to new current directory.</li> <li>- Added <i>arduino-cli lib update-index</i> command.</li> <li>- Added <i>arduino-cli lib list</i> command.</li> <li>- Added <i>arduino-cli lib upgrade</i> command.</li> <li>- Changed : to @ for <i>arduino-cli lib install</i> command.</li> </ul>
1.0	04/14/2019	Initial version.