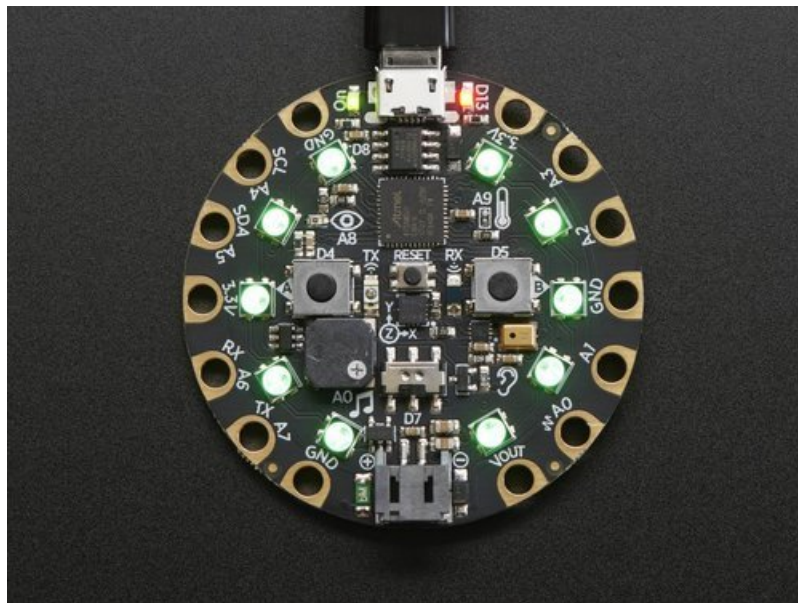


Adafruit Circuit Playground Express

Created by lady ada



Last updated on 2021-05-05 09:57:30 PM EDT

Guide Contents

Guide Contents	2
Overview	9
Classic vs. Express	12
How to tell if you have a Classic	12
How to tell if you have an Express	12
Guided Tour	14
Power and Data	14
Micro B USB connector	14
JST Battery Input	15
Alligator/Croc Clip Pads	15
Microchips	15
LEDs	16
Green ON LED	16
Red #13 LED	16
10 x Color NeoPixel LED	17
Speaker	17
Sensors	17
Light Sensor	18
Temperature Sensor	18
Microphone Audio Sensor	18
Motion Sensor	19
Capacitive Touch	19
Switches & Buttons	19
Infrared Receive/Transmit & Proximity	20
Pinouts	22
Power Pads	22
Input/Output Pads	23
Common to all pads	23
Each Pin!	24
Internally Used Pins!	24
Update the Bootloader (Mac Users Especially!)	26
Updating Your Circuit Playground Express Bootloader (see below for other boards)	26
Oh no, I updated MacOS already and I can't see CPLAYBOOT!	28
Upgrading Other Boards	28
Windows Driver Installation	29
Manual Driver Installation	31
Code.org CSD	32
Step 1. Connect to USB	32
Step 2. Press RESET to get into bootloader mode	32
Step 3. Copy over Firmata firmware	32
MakeCode	34
What is MakeCode?	35
Editing Blocks	38
Blinky!	38
Downloading and Flashing	40
Step 1: Bootloader mode	40

Step 2: Compile and Download	41
Running MakeCode that's Already Loaded	42
Saving and Sharing	44
Extracting your code from the Circuit Playground	44
Sharing	44
Editing JavaScript	45
Apps	46
Windows Store	46
Node.JS	46
Other Good Stuff	47
GitHub packages	47
We are Open Source on GitHub	47
We have crowd-sourced translations	47
MakeCode and Windows 10	48
The MakeCode App for Windows 10	48
Installation	48
See More MakeCode Projects	50
What is CircuitPython?	51
CircuitPython is based on Python	51
Why would I use CircuitPython?	51
CircuitPython	53
Install or update CircuitPython!	53
Further Information	55
Installing Mu Editor	56
Download and Install Mu	56
Using Mu	56
Creating and Editing Code	58
Creating Code	58
Editing Code	60
Your code changes are run as soon as the file is done saving.	60
1. Use an editor that writes out the file completely when you save it.	61
2. Eject or Sync the Drive After Writing	62
Oh No I Did Something Wrong and Now The CIRCUITPY Drive Doesn't Show Up!!!	62
Back to Editing Code...	62
Exploring Your First CircuitPython Program	62
Imports & Libraries	63
Setting Up The LED	63
Loop-de-loops	63
What Happens When My Code Finishes Running?	64
What if I don't have the loop?	64
More Changes	64
Naming Your Program File	65
Connecting to the Serial Console	66
Are you using Mu?	66
Setting Permissions on Linux	67
Using Something Else?	67
Interacting with the Serial Console	68
The REPL	71
Returning to the serial console	74
CircuitPython Libraries	75

Installing the CircuitPython Library Bundle	76
Example Files	77
Copying Libraries to Your Board	77
Example: ImportError Due to Missing Library	77
Library Install on Non-Express Boards	79
Updating CircuitPython Libraries/Examples	79
Frequently Asked Questions	80
I have to continue using an older version of CircuitPython; where can I find compatible libraries?	80
Is ESP8266 or ESP32 supported in CircuitPython? Why not?	80
How do I connect to the Internet with CircuitPython?	80
Is there asyncio support in CircuitPython?	80
My RGB NeoPixel/DotStar LED is blinking funny colors - what does it mean?	80
What is a MemoryError?	81
What do I do when I encounter a MemoryError?	81
Can the order of my import statements affect memory?	81
How can I create my own .mpy files?	81
How do I check how much memory I have free?	81
Does CircuitPython support interrupts?	81
Does Feather M0 support WINC1500?	81
Can AVRs such as ATmega328 or ATmega2560 run CircuitPython?	82
Commonly Used Acronyms	82
Troubleshooting	83
Always Run the Latest Version of CircuitPython and Libraries	83
I have to continue using CircuitPython 5.x, 4.x, 3.x or 2.x, where can I find compatible libraries?	83
CPLAYBOOT, TRINKETBOOT, FEATHERBOOT, or GEMMABOOT Drive Not Present	83
You may have a different board.	83
MakeCode	83
MacOS	84
Windows 10	84
Windows 7 or 8.1	84
Windows Explorer Locks Up When Accessing boardnameBOOT Drive	85
Copying UF2 to boardnameBOOT Drive Hangs at 0% Copied	85
CIRCUITPY Drive Does Not Appear	85
Windows 7 and 8.1 Problems	86
Serial Console in Mu Not Displaying Anything	86
CircuitPython RGB Status Light	86
ValueError: Incompatible .mpy file.	87
CIRCUITPY Drive Issues	87
Easiest Way: Use storage.erase_filesystem()	88
Old Way: For the Circuit Playground Express, Feather M0 Express, and Metro M0 Express:	88
Old Way: For Non-Express Boards with a UF2 bootloader (Gemma M0, Trinket M0):	89
Old Way: For non-Express Boards without a UF2 bootloader (Feather M0 Basic Proto, Feather Adalogger, Arduino Zero):	89
Running Out of File Space on Non-Express Boards	90
Delete something!	90
Use tabs	90
MacOS loves to add extra files.	90
Prevent & Remove MacOS Hidden Files	90
Copy Files on MacOS Without Creating Hidden Files	91
Other MacOS Space-Saving Tips	91
Device locked up or boot looping	92

Uninstalling CircuitPython	94
Backup Your Code	94
Moving Circuit Playground Express to MakeCode	94
Moving to Arduino	95
Welcome to the Community!	97
Adafruit Discord	97
Adafruit Forums	98
Adafruit Github	99
ReadTheDocs	100
CircuitPython Made Easy	101
CircuitPython Playground	102
CircuitPython Pins and Modules	103
CircuitPython Pins	103
import board	103
I2C, SPI, and UART	104
What Are All the Available Names?	105
Microcontroller Pin Names	106
CircuitPython Built-In Modules	106
CircuitPython Built-Ins	107
Thing That Are Built In and Work	107
Flow Control	107
Math	107
Tuples, Lists, Arrays, and Dictionaries	107
Classes, Objects and Functions	107
Lambdas	107
Random Numbers	107
CircuitPython Digital In & Out	108
Going Beyond the Lesson!	109
Experiment 1	109
Experiment 2	109
CircuitPython Analog In	111
Creating an Analog Input	112
GetVoltage Helper	112
Main Loop	112
CircuitPython Analog Out	114
Creating an analog output	114
Setting the analog output	114
Main Loop	114
Find the pin	115
CircuitPython PWM	119
PWM with Fixed Frequency	119
Create a PWM Output	120
Main Loop	120
PWM Output with Variable Frequency	120
Wire it up	121
Where's My PWM?	126
CircuitPython Servo	127
Servo Wiring	127
Standard Servo Code	129
Continuous Servo Code	129
CircuitPython Audio Out	131
Basic Tones	131

Playing Audio Files	133
CircuitPython Cap Touch	136
Creating an capacitive touch input	137
Main Loop	137
Capacitive Touch and the Audio Pin on Circuit Playground Bluefruit	141
CircuitPython NeoPixel	142
CircuitPython DotStar	146
Wire It Up	146
The Code	147
Create the LED	149
DotStar Helpers	150
Main Loop	150
Is it SPI?	150
Read the Docs	151
CircuitPython UART Serial	152
The Code	153
Wire It Up	154
Where's my UART?	157
Trinket M0: Create UART before I2C	158
CircuitPython I2C	159
Wire It Up	159
Find Your Sensor	162
I2C Sensor Data	163
Where's my I2C?	164
CircuitPython HID Keyboard	166
CircuitPython HID Keyboard and Mouse	169
CircuitPython Keyboard Emulator	169
Create the Objects and Variables	170
The Main Loop	171
CircuitPython Mouse Emulator	171
Create the Objects and Variables	173
CircuitPython HID Mouse Helpers	173
Main Loop	173
CircuitPython CPU Temp	175
CircuitPython Storage	176
Logging the Temperature	177
CircuitPython Expectations	180
Always Run the Latest Version of CircuitPython and Libraries	180
I have to continue using CircuitPython 3.x or 2.x, where can I find compatible libraries?	180
Switching Between CircuitPython and Arduino	180
The Difference Between Express And Non-Express Boards	180
Non-Express Boards: Gemma, Trinket, and QT Py	181
Small Disk Space	181
No Audio or NVM	181
Differences Between CircuitPython and MicroPython	181
Differences Between CircuitPython and Python	181
Python Libraries	181
Integers in CircuitPython	181
Floating Point Numbers and Digits of Precision for Floats in CircuitPython	182
Differences between MicroPython and Python	182
Playground Light Sensor	183

Playground Temperature	185
Playground Drum Machine	187
Playground Sound Meter	191
Arduino	194
Set Up Arduino IDE	195
Install SAMD Support	195
Install Drivers (Windows 7 Only)	196
Blink	196
Successful Upload	197
Compilation Issues	197
Manually bootloading	197
Ubuntu & Linux Issue Fix	198
Arduino Switches	199
Without Library Assist	199
Adapting Sketches to M0 & M4	201
Analog References	201
Pin Outputs & Pullups	201
Serial vs SerialUSB	201
AnalogWrite / PWM on Feather/Metro M0	202
analogWrite() PWM range	203
analogWrite() DAC on A0	203
Missing header files	203
Bootloader Launching	203
Aligned Memory Access	203
Floating Point Conversion	204
How Much RAM Available?	204
Storing data in FLASH	204
Pretty-Printing out registers	204
M4 Performance Options	205
CPU Speed (overclocking)	205
Optimize	205
Cache	206
Max SPI and Max QSPI	206
Enabling the Buck Converter on some M4 Boards	206
Troubleshooting	207
Using external NeoPixel strips/dots with Circuit Playground in Arduino	207
CPLAYBOOT Does not Appear on Windows 10; "ARM7TDMI" Error in Arduino	207
Accessories	209
Packs	209
Connections	210
Capacitive Touch	213
Robotics	219
Sewable	220
Power	223
UF2 Bootloader Details	232
Entering Bootloader Mode	233

Using the Mass Storage Bootloader	235
Using the BOSSA Bootloader	236
Windows 7 Drivers	236
Verifying Serial Port in Device Manager	236
Running bossac on the command line	238
Using bossac Versions 1.7.0, 1.8	238
Using bossac Versions 1.9 or Later	238
Updating the bootloader	239
Getting Rid of Windows Pop-ups	240
Making your own UF2	241
Installing the bootloader on a fresh/bricked board	241
Downloads	242
Files:	242
Circuit Playground Express Schematic	242

