

Programming the Bootloader

↗ 1 backlink

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Unless you've soldered on a new SAMD51 microcontroller, it's likely the bootloader is already programmed for you.

Flashing a new bootloader

Requirements:

- ☐ Download and install [Atmel Studio 7](#) (not required, but recommended)
- ☐ JTAG programmer with SWD interface (the [SEGGER J-Link EDU mini](#) work and cost \$18)
- ☐ Download the [.uf2](#) and [.bin](#) files from the [PyCubed GitHub](#)

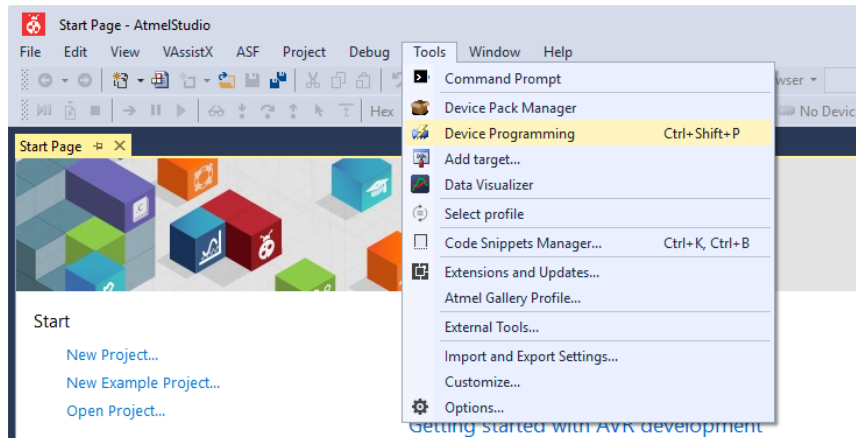
bootloader flashing is only required once- on brand-new SAMD51 that haven't been used on a PyCubed board before.

ensure the external watch dog (U1) is not populated (or connection to the RESET line is removed) before trying to program the bootloader.

Instructions:

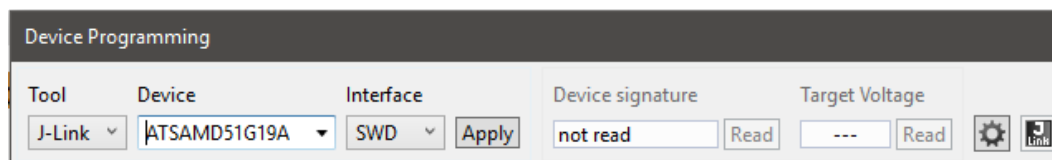
1. With the requirements above satisfied, plug the JTAG programmer into your computer and open Atmel Studio 7.

2. Navigate to Tools → Device Programming, as shown:

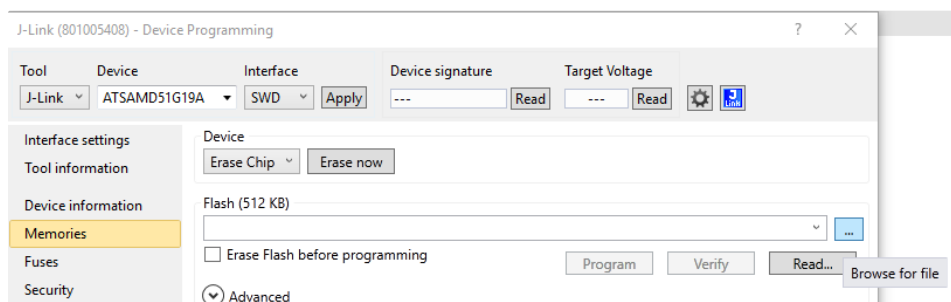


3. Select the appropriate Tool and Device from the drop-down menus and click apply.

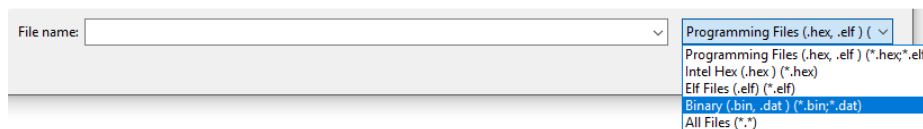
make sure to choose the correct microcontroller part number.
Visually check the part markings on the SAMD51 to confirm if it's the SAMD51x19 or SAMD51x20.



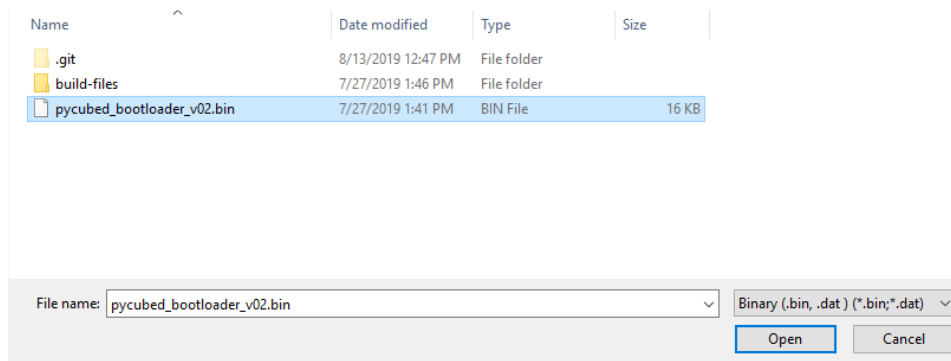
4. Navigate to "Memories" on the left-hand side.
5. Uncheck the "Erase Flash before programming" box, and then click the "..." button, as shown:



6. Navigate to the directory you saved the GitHub firmware files, and change the file parameters from "Programming Files" to "Binary" and shown:



7. Select the `.bin` file downloaded previously and click the "Open" button:



8. Now make the following connections to the PyCubed board. If you're careful, you can avoid soldering header-pins to the board by just holding jumper-wire pins (or pogo pins, if you have them) against the through-holes during programming. When in doubt, solder the header pins.

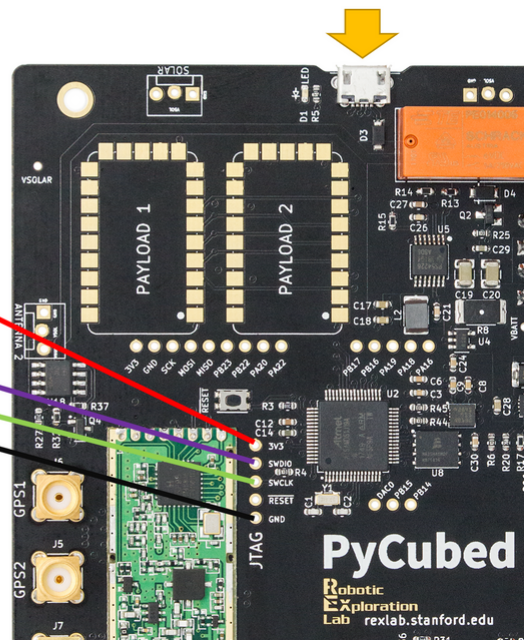
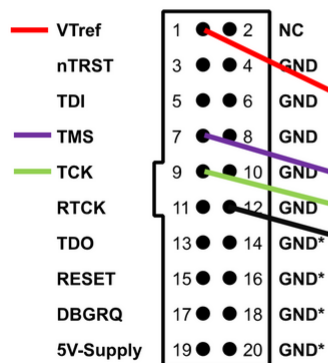
Required Connections:

- ☐ Main micro USB cable (to provide power)

Note: it's good practice to use a multimeter and confirm 3.3V is present when the USB connection is made to the PyCubed board. If the voltage doesn't read 3.3V between "3V3" and "GND" you need to troubleshoot that first.

- ☐ VTref (connected to 3V3)
- ☐ TMS (connected to SWDIO)
- ☐ TCK (connected to SWCLK)
- ☐ GND (connected to GND)

Necessary SWD Connections

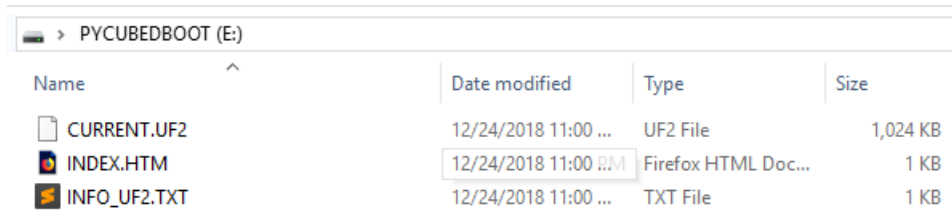


9. With the connections made, return to Atmel Studio 7 and click the "Read" button. A device signature should populate. If an error appears, check connections and troubleshoot the specific error message.

► Common Errors



10. After receiving a device signature, click the "Program" button.
Programming should only take a few moments.
11. Successful bootloader programming will trigger the PyCubed board to reboot. After a few moments, the board should mount to the computer as a **PYCUBEDBOOT** drive.

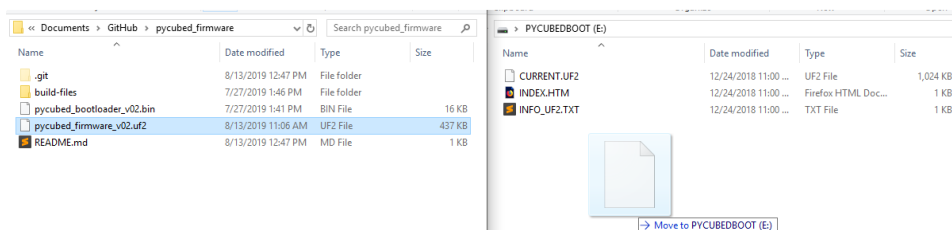


A screenshot of a Windows File Explorer window showing the contents of the PYCUBEDBOOT (E:) drive. The drive contains three files: CURRENT.UF2 (1,024 KB, UF2 File), INDEX.HTM (1 KB, Firefox HTML Doc...), and INFO_UF2.TXT (1 KB, TXT File). The INDEX.HTM file is highlighted with a mouse cursor.

Name	Date modified	Type	Size
CURRENT.UF2	12/24/2018 11:00 ...	UF2 File	1,024 KB
INDEX.HTM	12/24/2018 11:00 ...	Firefox HTML Doc...	1 KB
INFO_UF2.TXT	12/24/2018 11:00 ...	TXT File	1 KB

Flashing the Firmware:

12. Drag the CircuitPython firmware **.uf2** file downloaded previously to the **PYCUBEDBOOT** drive:



13. As soon as the file is done transferring, the board will reboot again and mount as **CIRCUITPY** or **PYCUBED** and is now a functioning CircuitPython board. Congratulations!

Note: now is a good time to load the default libraries to the **lib** folder as described in: [Adding/Updating Libraries](#)

14. The firmware loaded in step 12 makes it possible to safely solder the external watch dog (U1) onto the board.

Checking the bootloader:

1. Connect the PyCubed board to your computer via USB
2. Quickly double-click the "RESET" button located on the top of the board

The pace of the double-click can be difficult. If it doesn't work,

