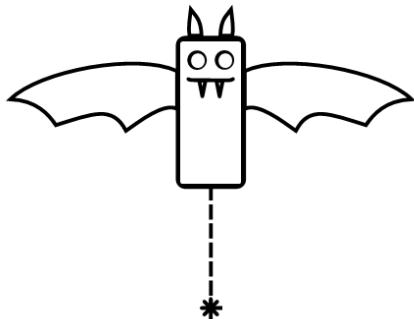


BRIC4 Firmware Update

Rev C

Kris Fausnight, March 7, 2021



Introduction

This document provides instructions on setting up the SAM-BA host bootloader and updating firmware on the BRIC4 device main CPU. The steps required are unnecessarily complicated and it is planned to create a more streamlined application in the near future. This procedure will only update the main CPU firmware but not the BLE Laird BL652 module which will be covered in another document or future version of this document.

To set up the bootloader, the off-the-shelf SAM-BA v2.18 host software must be installed and then modified. Two files will be provided by Kris Fausnight (kfausnight@gmail.com): “**boards.tcl**” and “**BRIC4_atsaml21g18b.tcl**”.

The firmware update binary file will also be provided, of the format “**BRIC4_v1_XX.bin**” where “**XX**” indicates the firmware version.

Updating firmware of the device will not affect the calibration, user-settings, and saved measurements as these are stored on the EEPROM and SD card.

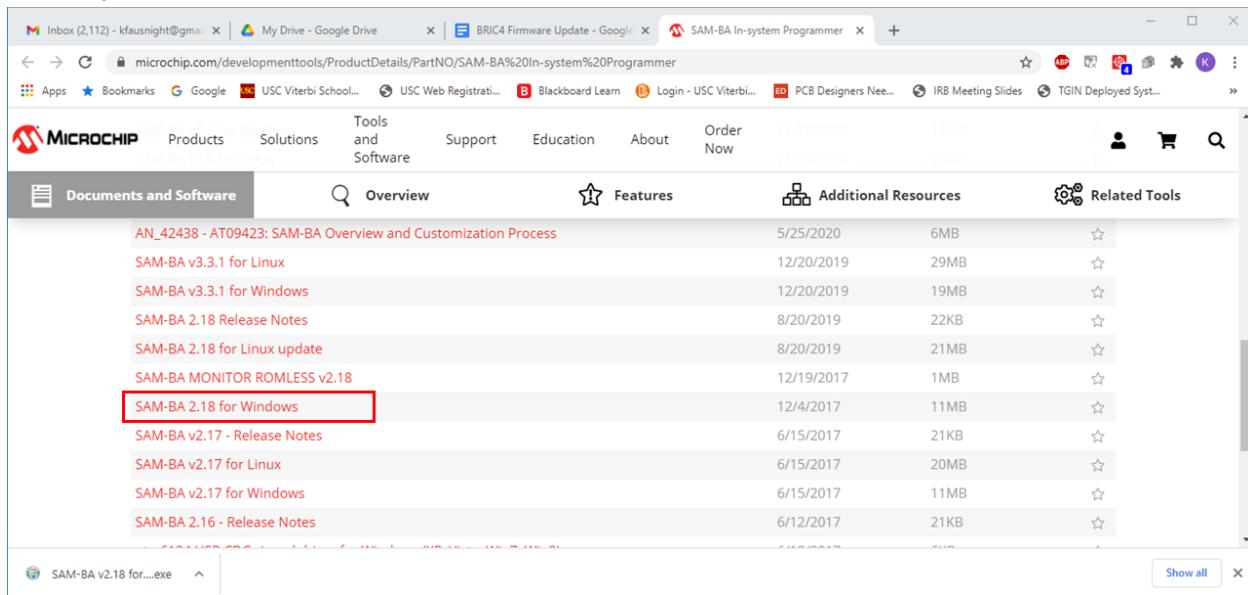
Set Up Bootloader Host Software

Install SAM-BA Software

Install the SAM-BA v2.18 software from the microchip.com website here:

<https://www.microchip.com/developmenttools/ProductDetails/PartNO/SAM-BA%20In-system%20Programmer>

Select the “SAM-BA v2.18 for Windows”. If necessary, the “SAM-BA v2.17 for Linux” will probably work too but has not been tested.



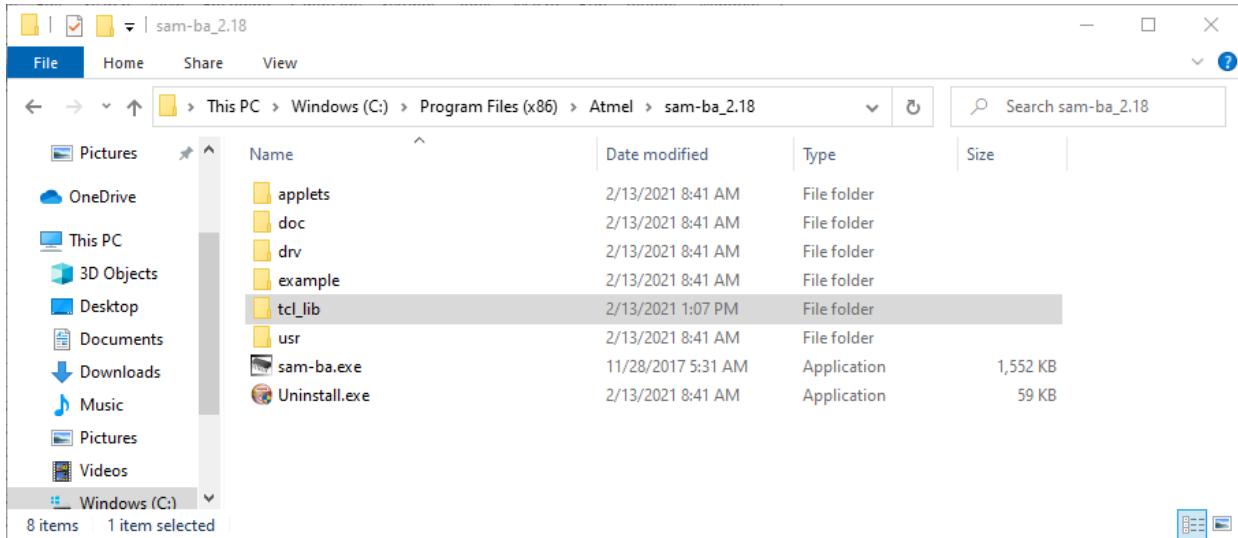
The screenshot shows a web browser window with the Microchip website open. The URL in the address bar is <https://www.microchip.com/developmenttools/ProductDetails/PartNO/SAM-BA%20In-system%20Programmer>. The page displays a list of software downloads under the "Documents and Software" section. The "SAM-BA 2.18 for Windows" file is highlighted with a red box. The table below lists the files:

File Name	Last Updated	Size	Action
AN_42438 - AT09423: SAM-BA Overview and Customization Process	5/25/2020	6MB	Star
SAM-BA v3.3.1 for Linux	12/20/2019	29MB	Star
SAM-BA v3.3.1 for Windows	12/20/2019	19MB	Star
SAM-BA 2.18 Release Notes	8/20/2019	22KB	Star
SAM-BA 2.18 for Linux update	8/20/2019	21MB	Star
SAM-BA MONITOR ROMLESS v2.18	12/19/2017	1MB	Star
SAM-BA 2.18 for Windows	12/4/2017	11MB	Star
SAM-BA v2.17 - Release Notes	6/15/2017	21KB	Star
SAM-BA v2.17 for Linux	6/15/2017	20MB	Star
SAM-BA v2.17 for Windows	6/15/2017	11MB	Star
SAM-BA 2.16 - Release Notes	6/12/2017	21KB	Star

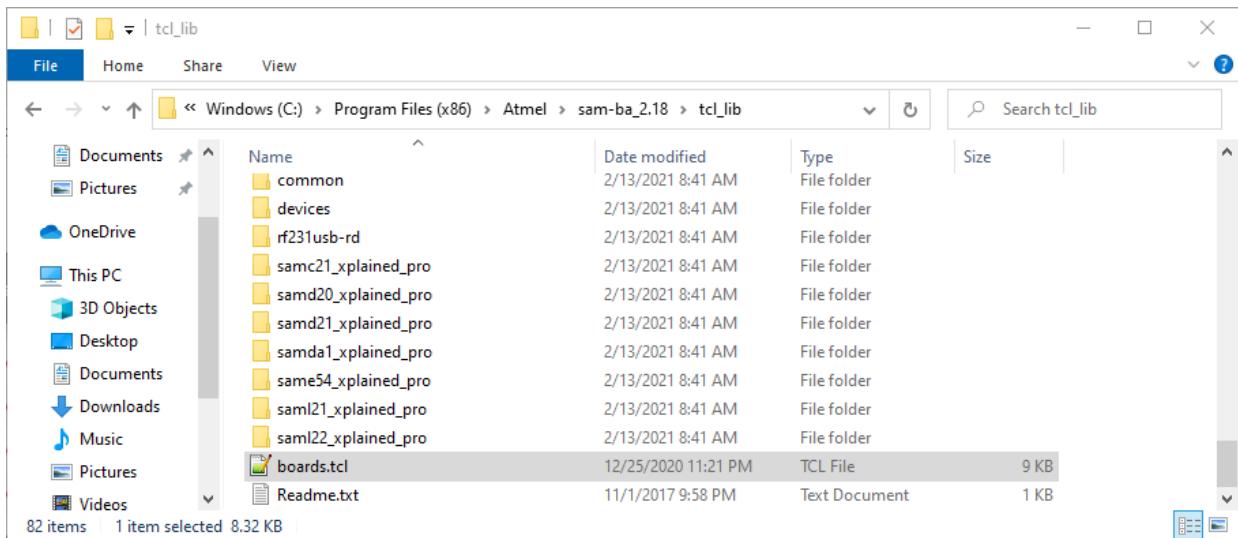
Follow all prompts to install into the program folder. Restarting the computer might be necessary.

Modify for use with BRIC4

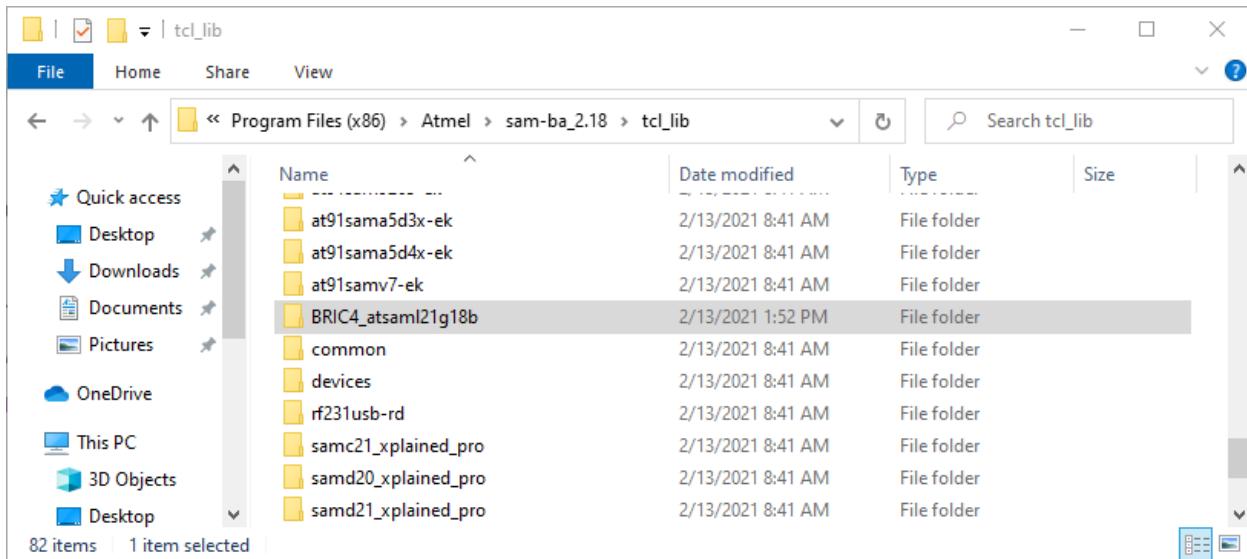
Navigate to the “`sam-ba_2.18`” application folder where it has been installed.



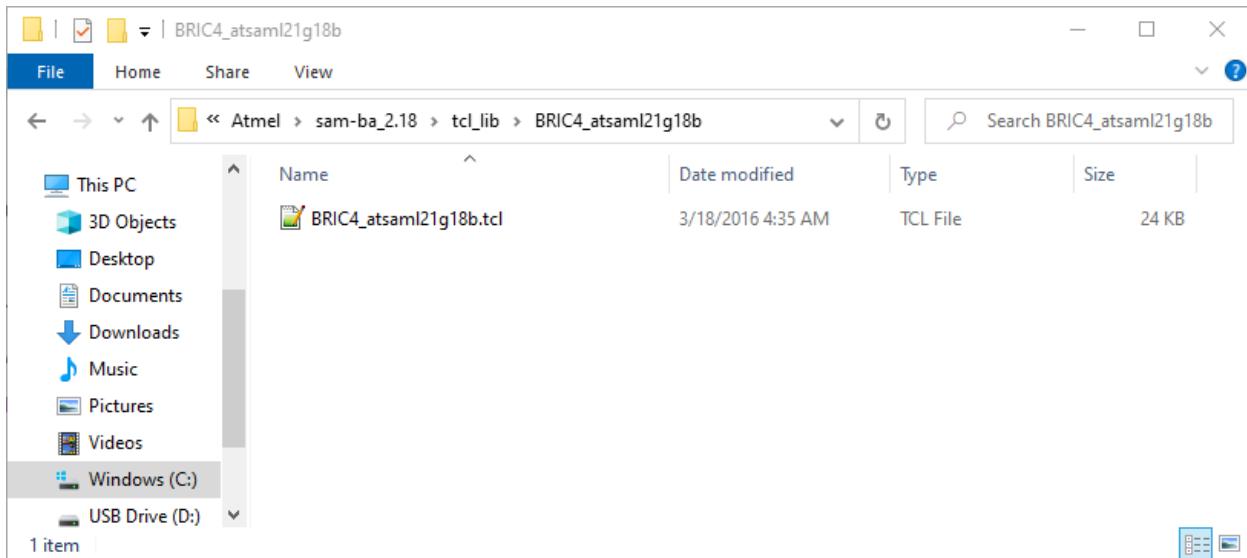
Navigate to the “`tcl/lib`” folder. Replace the file “**boards.tcl**” with the file provided by Kris Fausnight.



In the same “tcl_lib” folder, create the folder “**BRIC4_atsaml21g18b**”. Folder name must be exactly as shown.



In the newly created folder, copy in the file “**BRIC4_atsaml21g18b.tcl**” provided by Kris Fausnight.



The SAM-BA bootloader software should now be compatible with the BRIC4 device.

Update BRIC4 Firmware

Reboot BRIC4 Into Bootloader Mode

The device can be rebooted into Bootloader mode two ways, via “Software Reboot” or “Manual Reboot”. If the “Software Reboot” doesn’t work for any reason, try the “Manual Reboot”. In both cases, connect the device to the host computer with a USB Mini-B cable before rebooting.

By design, the BRIC4 will enter the bootloader mode if it is reset and the input button 1 is pressed. If the button is not pressed, it will proceed to the main application. The device is reset by shorting the top two pins in the JTAG header.

Software Reboot

Connect the device to the host computer via the USB port. On the BRIC4 device, navigate to the Firmware screen:

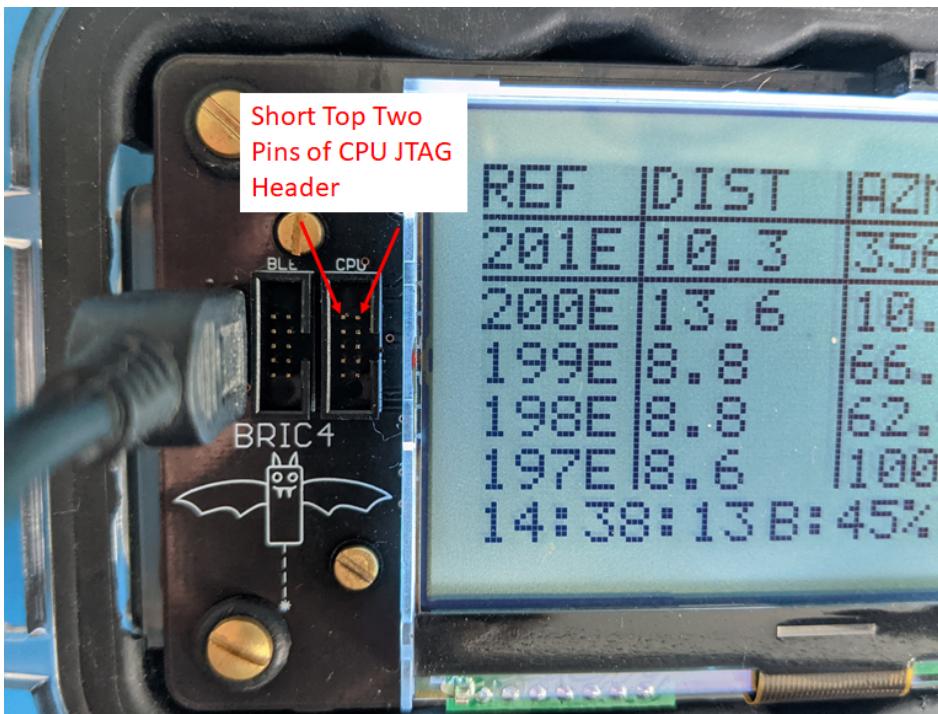
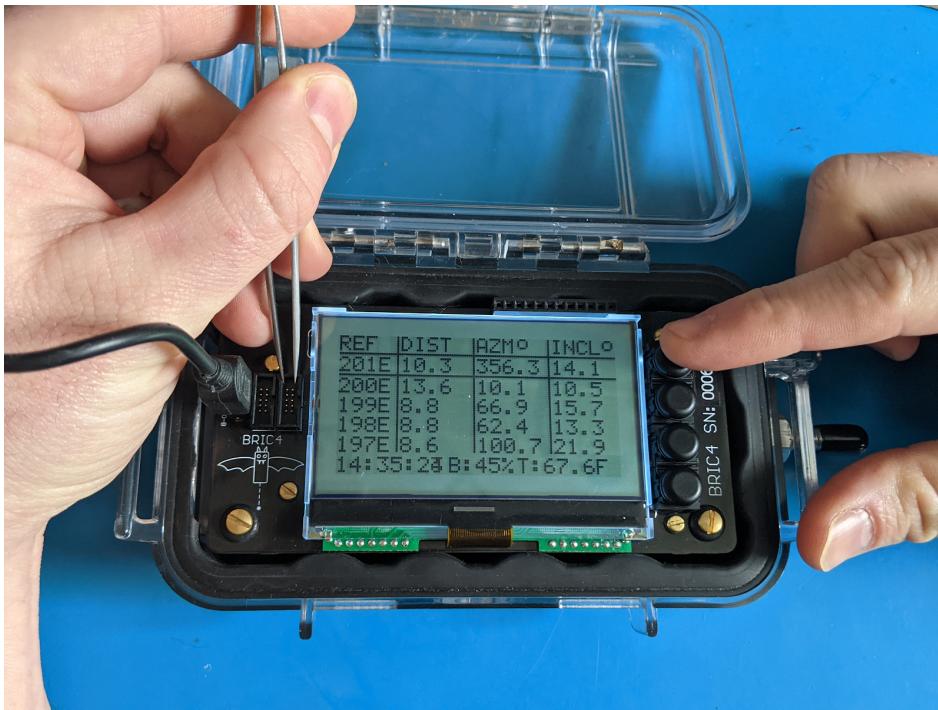
>Main Menu>Debug Menu>Firmware



Press and hold the top “Bootloader” button for a few seconds. The device will reboot into bootloader mode and the screen will be blank.

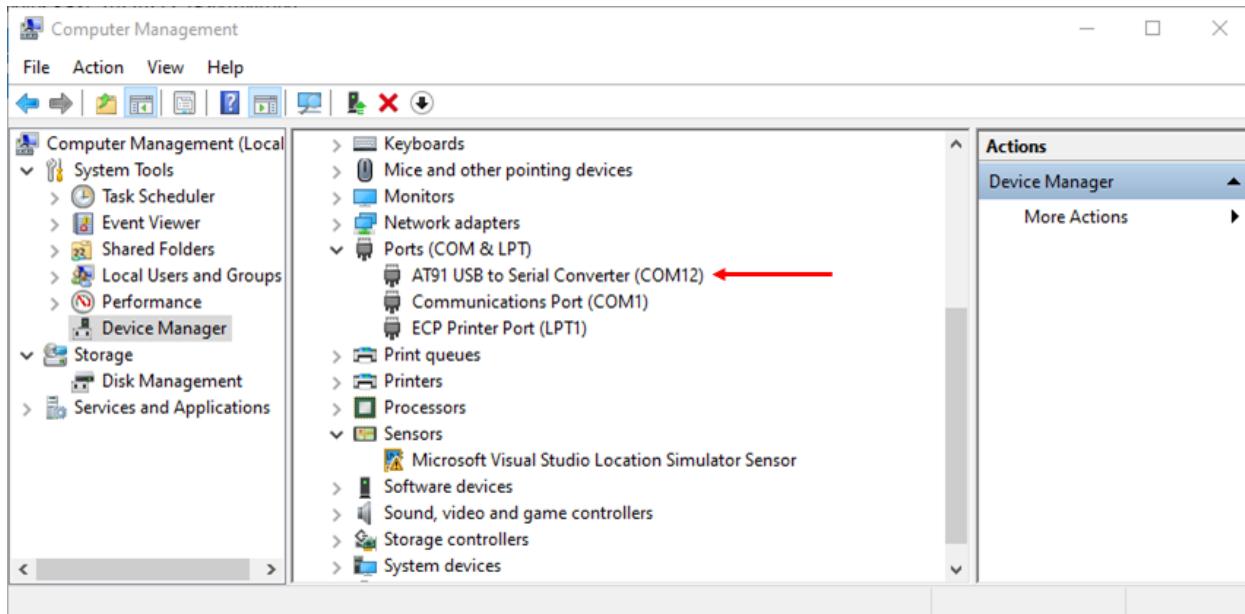
Manual Reboot

Connect the device to the host computer via the USB port. Press and hold the top button while shorting the top two pins on the CPU JTAG header. Tweezers, screwdriver, or any other tool may be used to short the pins but be careful not to bend them. Momentarily short the pins and once the screen goes blank, remove the short and remove finger from button in that order. The screen should remain blank and the device will be in Bootloader mode.

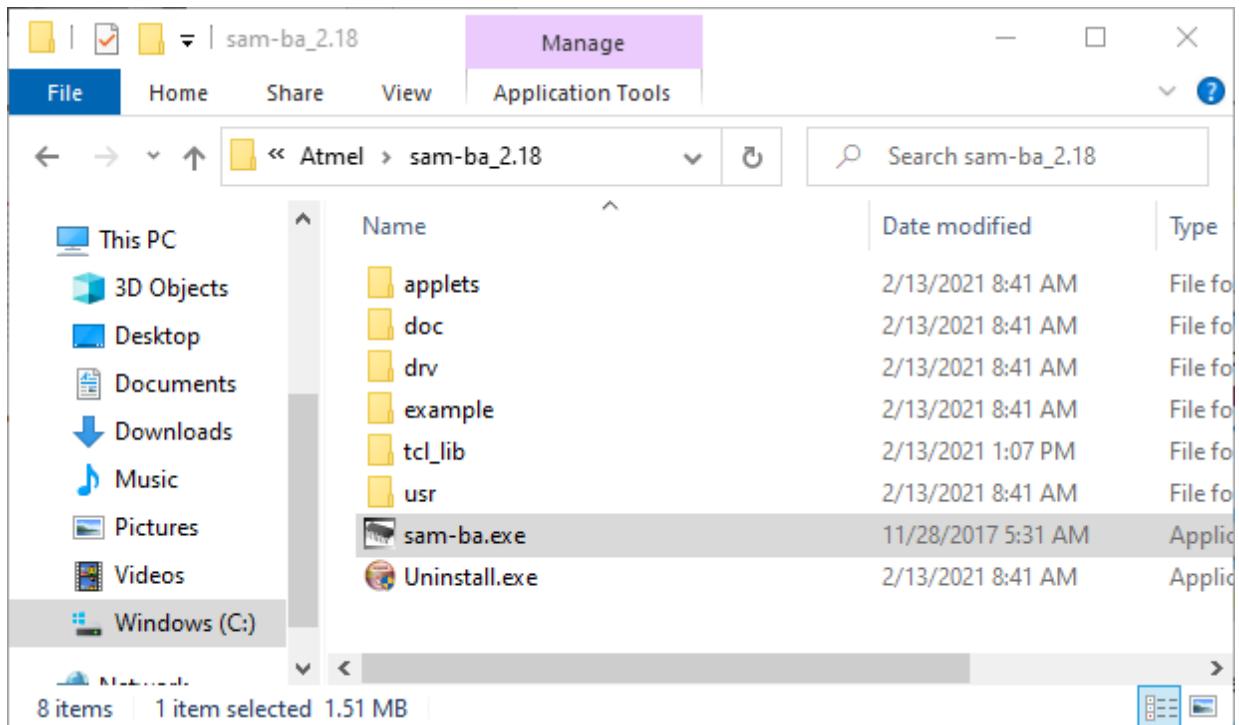


Connect to BRIC4 Bootloader

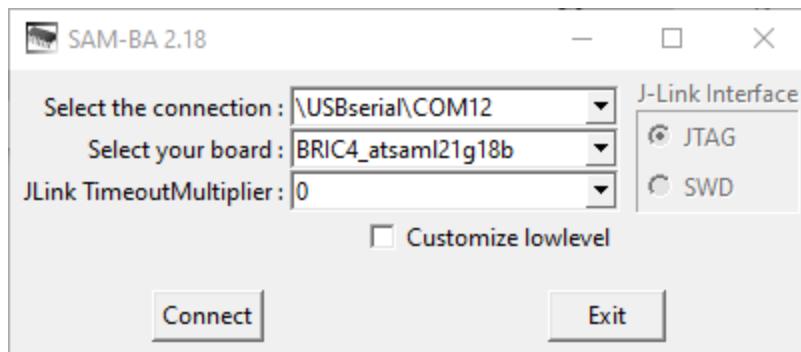
Connect the BRIC4 to the host computer with a USB-mini cable if not already connected. Use the “Device Manager” to locate the “AT91 USB to Serial Converter” and note the COM port #. In the image below, it is “COM12”.



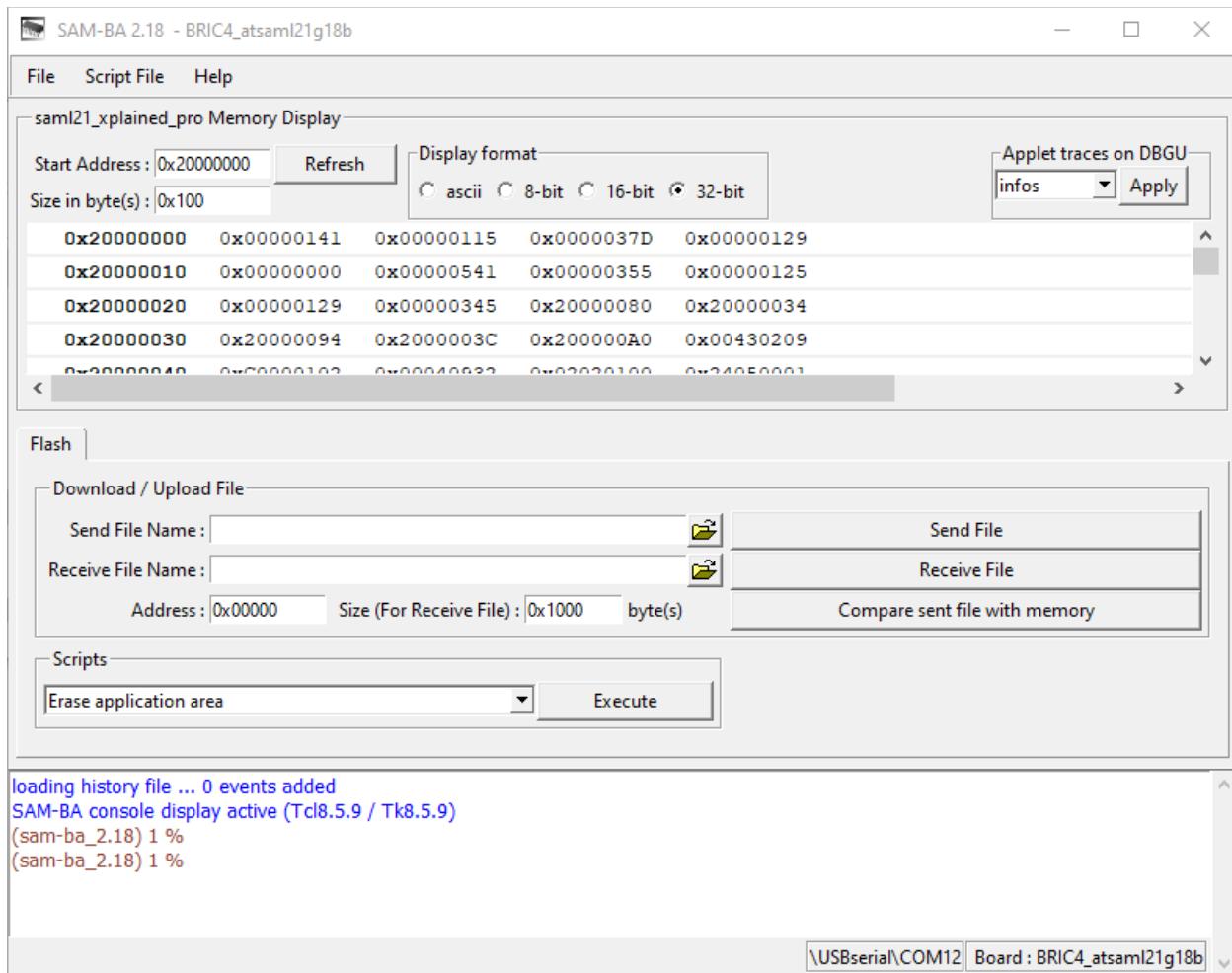
Launch the “SAM-BA 2.18” GUI either through the start menu or from the application folder.



The SAM-BA GUI window will load and give a few options. Under “Select the connection” select the COM port assigned to the AT91 USB connection. Under “Select your board”, select the **“BRIC4_atsaml21g18b”**. Leave any other settings as shown.

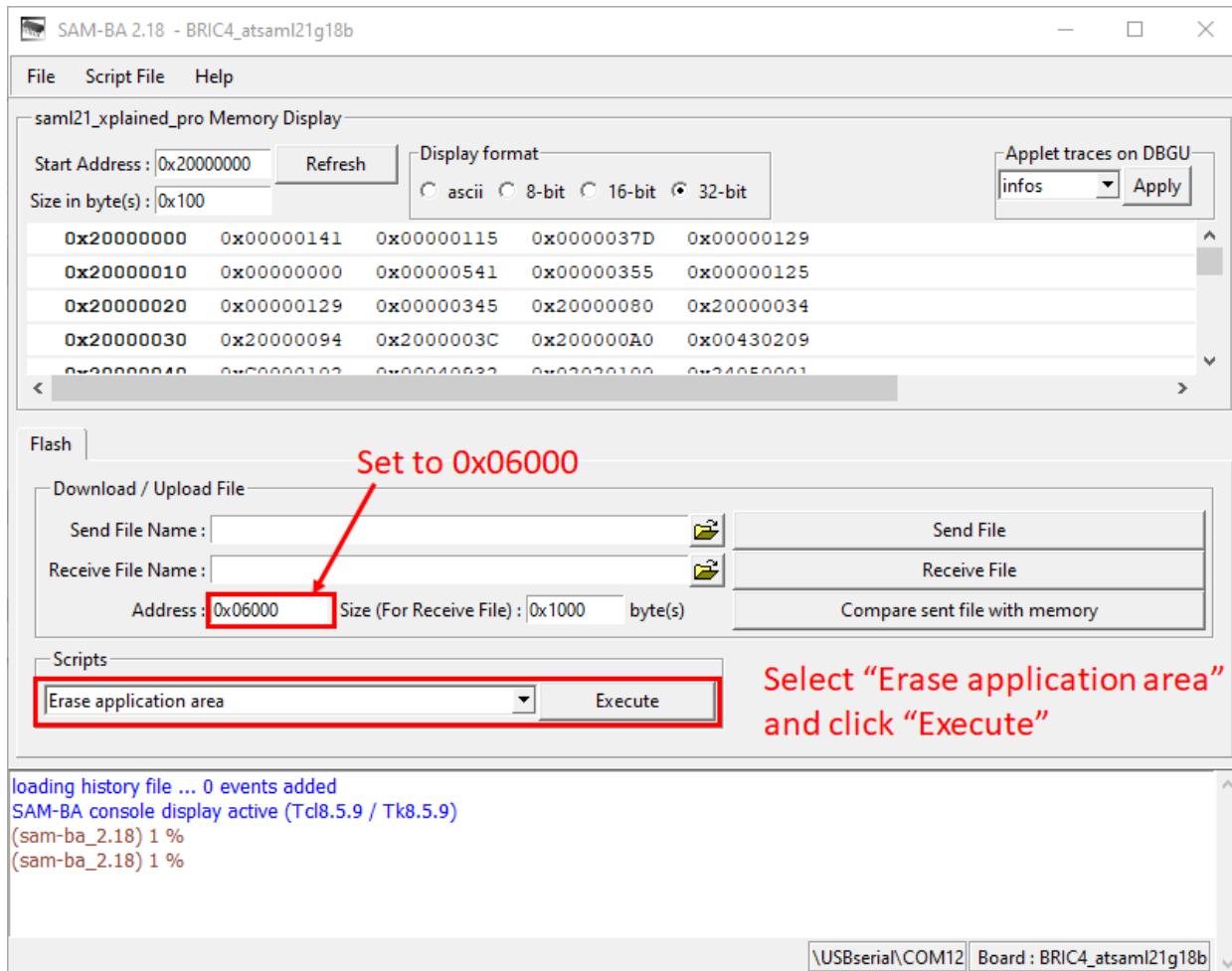


Click “Connect”. The main SAM-BA GUI window will appear as shown below.



Erase Previous Firmware

In the main SAM-BA GUI window, set the “Address” to **0x06000**. This is the starting address of the main application firmware. Select the script “**Erase application area**” and click “**Execute**”

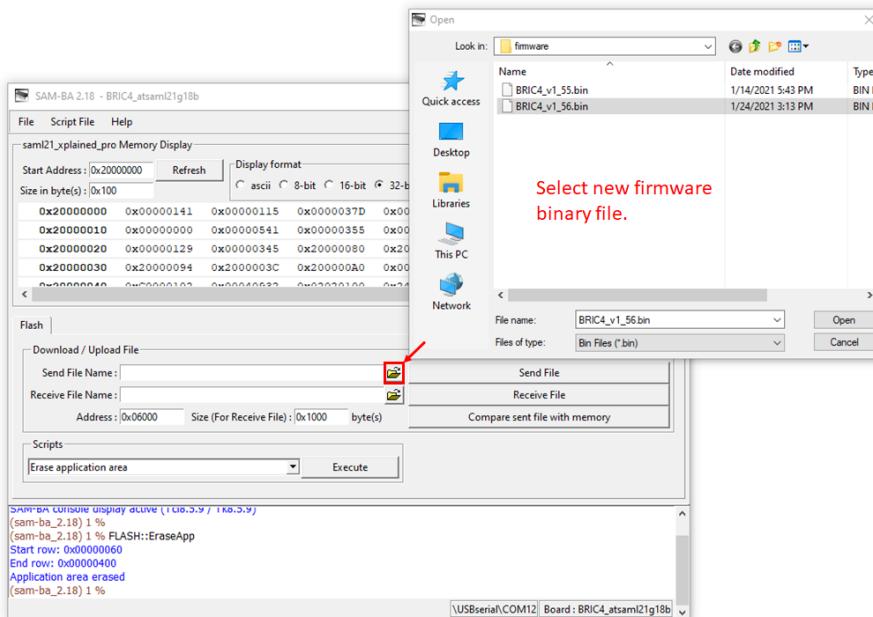


The “Erase application area” script should finish quickly in a few seconds and will display “Application area erased” after it completes.

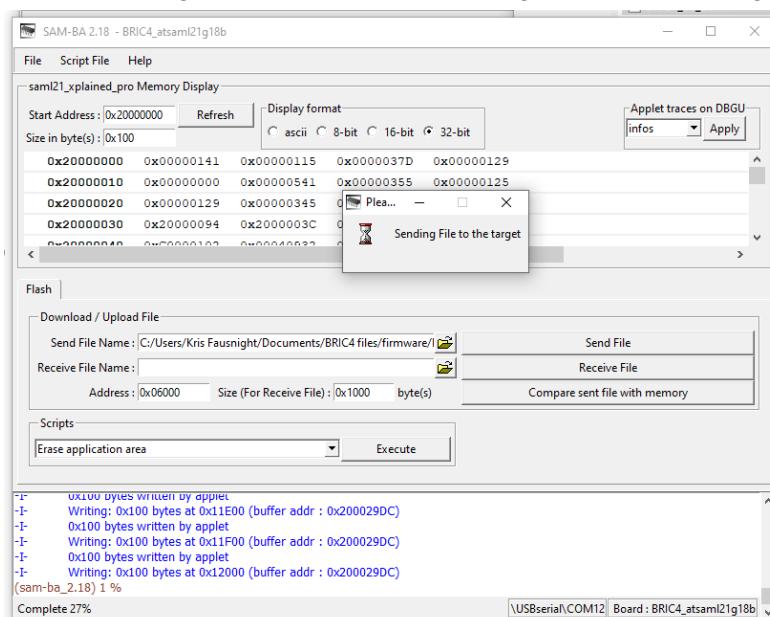


Load New Firmware

Click the “Send File Name” folder button and navigate to the new binary firmware file that will be loaded. The firmware file will be of the form “BRIC4_v1_XX.bin” where “XX” corresponds to the firmware version.

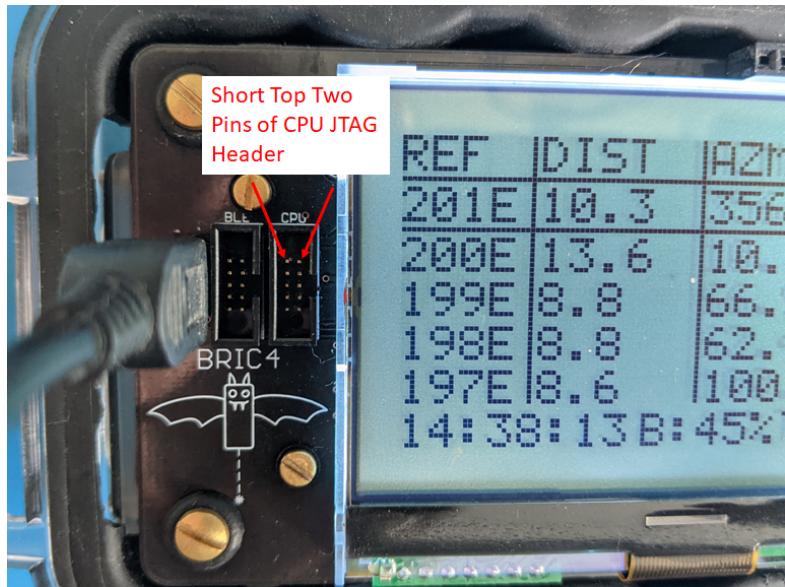


After selecting the file, click “Send File”. The loading process will take about 10-20 seconds. Sometimes a status window will pop up but it is inconsistent. There is no “complete” message but the loading is done when the messages stop appearing.

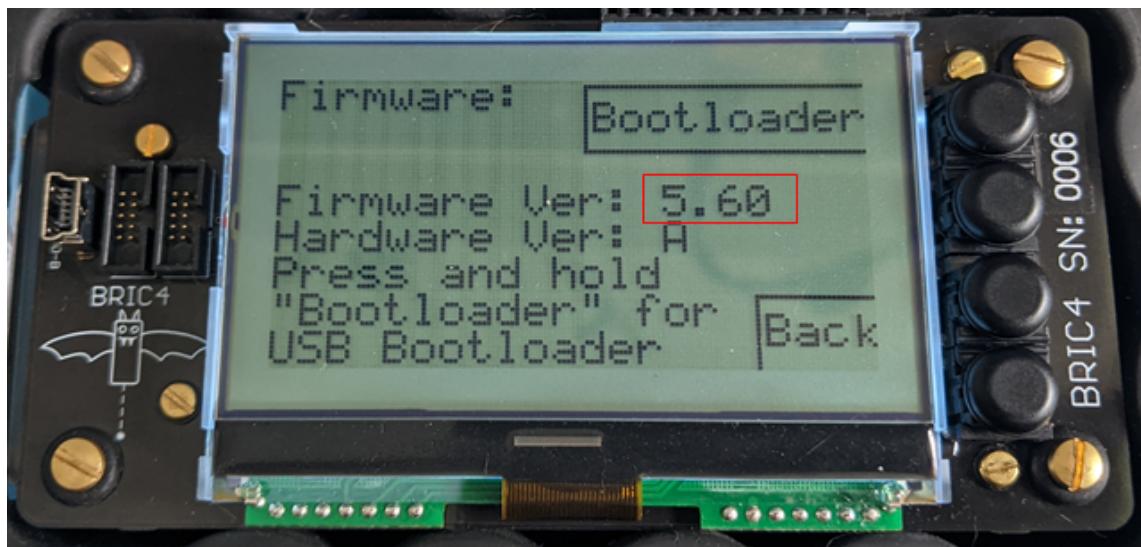


Reboot BRIC4 Into Main Application

After loading the new firmware, the device must be rebooted into the regular main application. The USB cable can be disconnected. Use tweezers, screwdriver, or other tool to short the top two pins of the CPU JTAG header. Be careful not to bend the pins. The device will immediately turn on and the main screen will appear. All calibration, user-settings, and measurements should be restored from prior to the firmware update.



The new firmware version can be viewed in >Main Menu>Debug Menu>Firmware

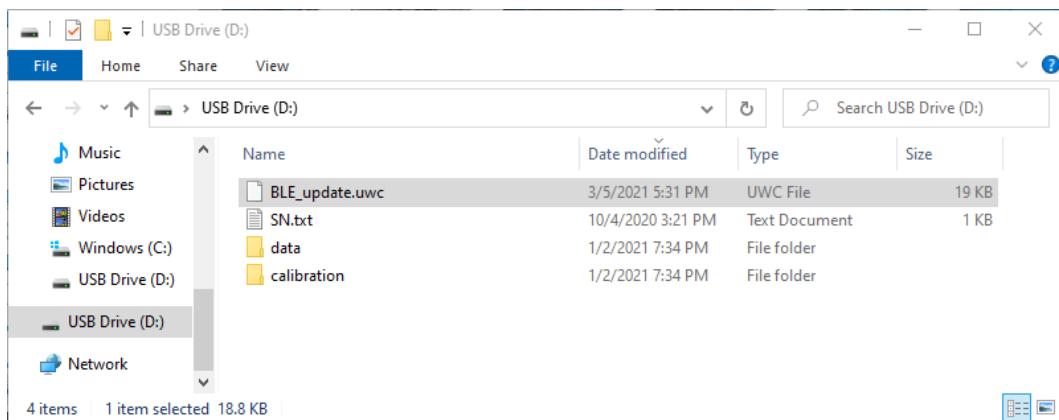


Update Bluetooth Module Firmware

The bluetooth module is a Laird BL652 module running smartBASIC application code. Many features of the bluetooth connection functionality, BLE services, and low-power options are part of the BL652 module firmware and may need to be updated periodically. This firmware is updated through the BRIC4 device using the firmware file loaded on the SD card.

Load Firmware File onto the BRIC4

Connect the BRIC4 to a computer using a mini-USB cable; it will appear as a mass-storage USB drive. Open the drive and copy in the file "**BLE_update.uwc**". The file must be named exactly as shown and must be in the main directory.

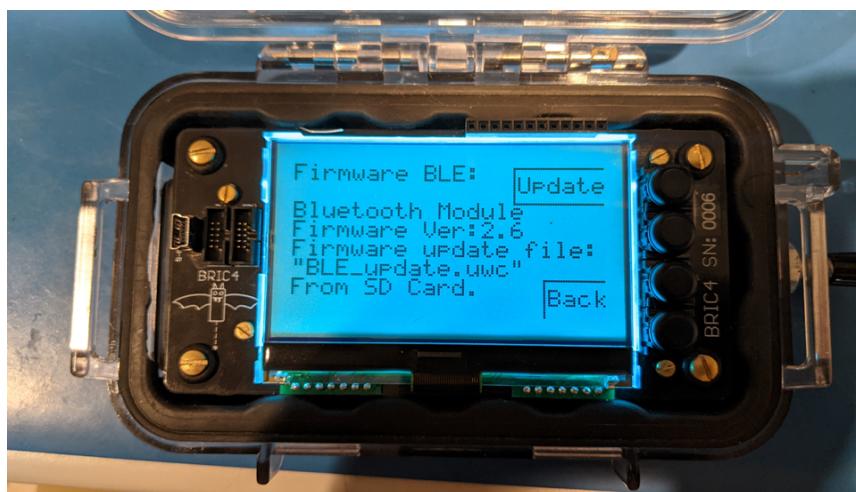


Upload Firmware to Bluetooth Module

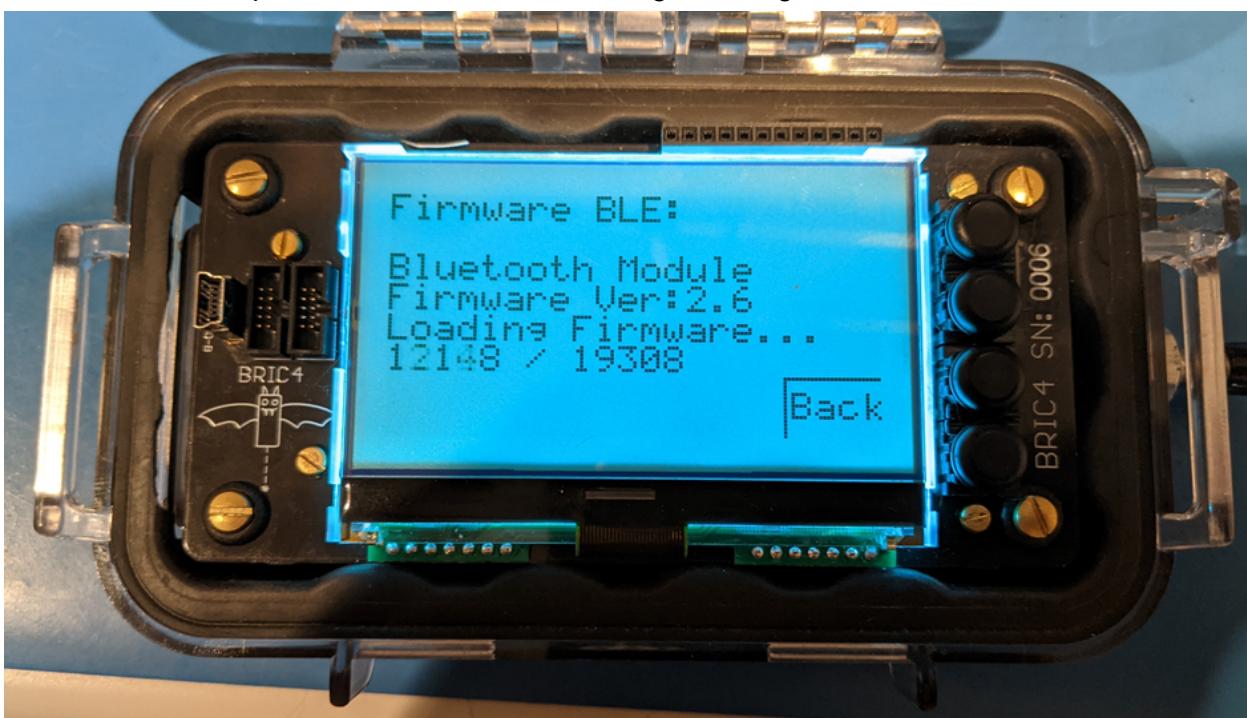
On the BRIC4 device, navigate to:

Main Menu>Advanced Menu>Firmware BLE

The current bluetooth module firmware is shown on the screen.



Press the button “Update” and the firmware will begin loading from the SD card.



If the firmware update was successful, it will display the message “BLE update OK” otherwise it will display a diagnostic error message. After a few seconds, the screen will refresh with the latest firmware version. Press the “Back” button to return.

