

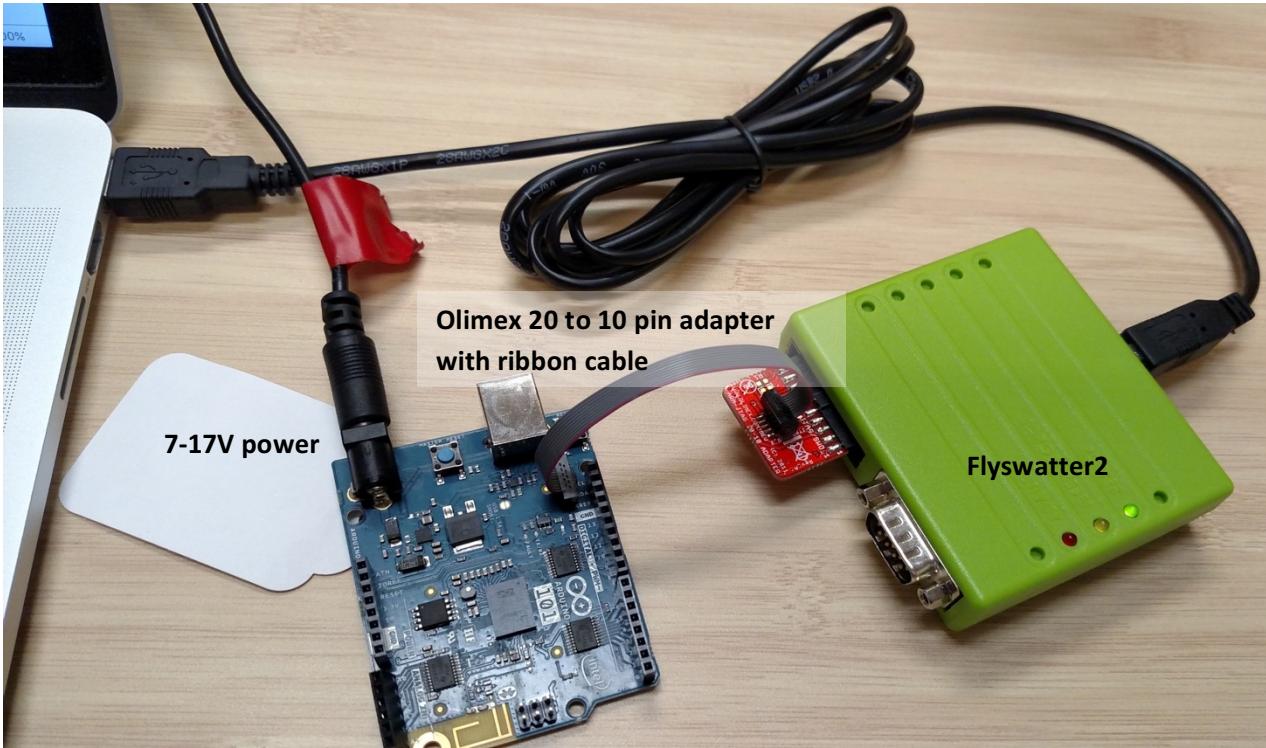
Arduino 101 Firmware Update

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Firmware Update using JTAG through Flyswatter2

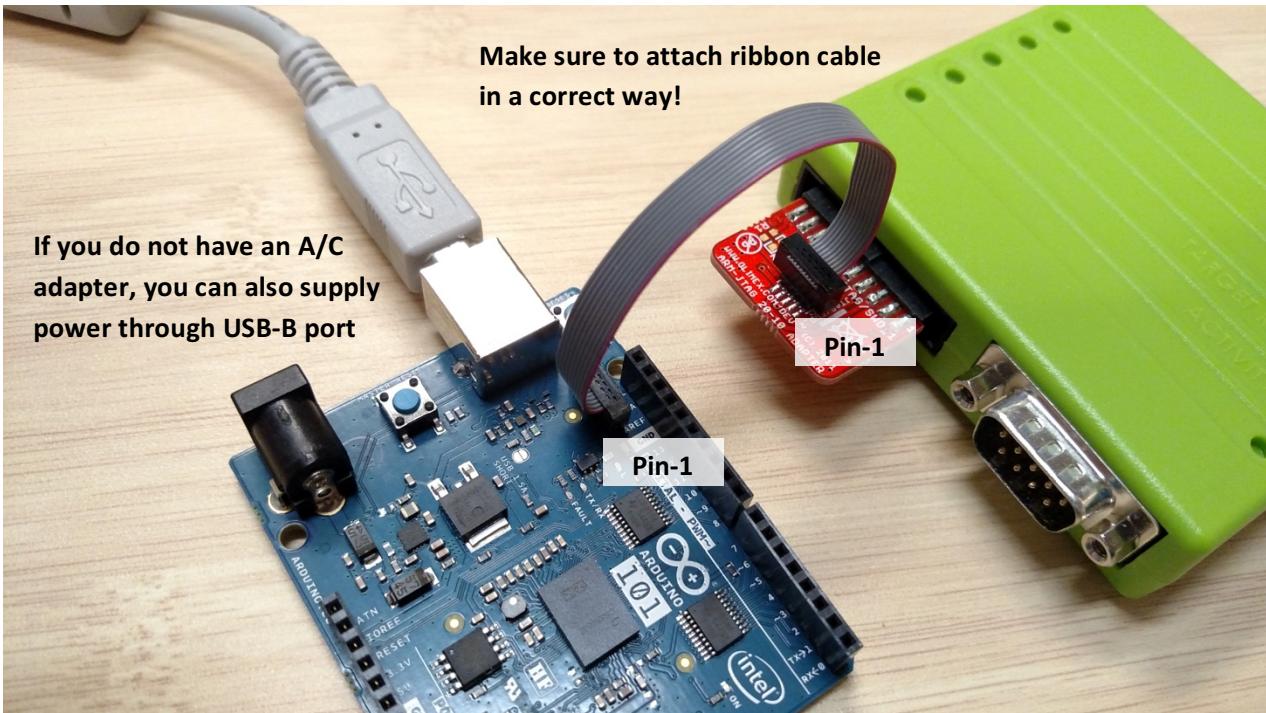
1. Connect all wires as shown on the picture



Components listing:

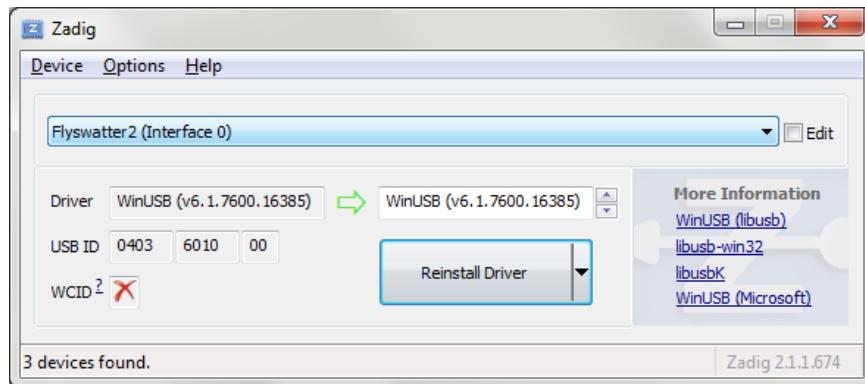
- Windows/Linux/macOS computer
- Flyswatter2 JTAG probe with USB cable
- Olimex 20 to 10 pin adapter with ribbon cable
- Arduino 101 board with 7-17V DC power supply (or USB-B cable)

Make sure to attach ribbon cable in a correct way, as shown on the photo!



2. Install Flyswatter2 probe drivers:

2.1. Windows



- a. Plug in Flyswatter2 probe to the host
- b. Download and extract the latest firmware release
- c. Go to bin\ directory, run zadig_2.1.1.exe.
- d. Options > List all devices.
- e. Select your probe (Flyswatter2), pick WinUSB and hit Reinstall Driver; do it for Interface 0 and Interface 1.
- f. Close Zadig and **REPLUG THE PROBE**

2.2. Linux

By default, non-root users won't have access to the JTAG pods connected via USB. You must grant write access to the proper /dev/bus/usb entry every time a device is connected to be able to run OpenOCD using a non-root account. The process can be automated by adding an udev rule. Simply create a text file in the rules directory:

```
$ sudo vim /etc/udev/rules.d/99-openocd.rules
```

The IDs depend on the JTAG device. For example, for the Flyswatter2 and the Olimex-ARM-USB-OCD-H, the rules file must have the following content:

```
SUBSYSTEM=="usb", ATTR{idVendor}=="0403", ATTR{idProduct}=="6010", MODE="0666"
SUBSYSTEM=="usb", ATTR{idVendor}=="15ba", ATTR{idProduct}=="002b", MODE="0666"
```

(See drivers/rules.d/99-openocd.rules)

You can also try flashing with sudo.

2.3 macOS

Download and install FTDI-D2XX driver: <http://www.ftdichip.com/Drivers/D2XX.htm>

You may need to unload FTDI-VCP driver. See the included OSX-FTDI-Fix.sh and run it with sudo prior to flashing.

3. Flash the firmware

In the extracted flash pack directory, run the flashing script:

- **Windows:** Execute (double-click) **flash_jtag.bat** in order to flash production image.
- **Linux & macOS:** Run **flash_jtag.sh** in order to flash production image

Below is what a successful flash looks like. Flashing takes about a minute.

```
C:\windows\system32\cmd.exe
Open On-Chip Debugger 0.8.0-dev-gb8c70a5 (2015-07-03-10:41)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.sourceforge.net/doc/doxygen/bugs.html
Info : only one transport option; autoselect 'jtag'
adapter speed: 1000 kHz
trst_only separate trst_push_pull
Info : clock speed 1000 kHz
Info : JTAG tap: firestarter.cltap tap/device found: 0x0e765013 (mfg: 0x009, part: 0xe765, ver: 0x0)
Enabling arc core tap
Info : JTAG tap: firestarter.arc-em enabled
Polling target arc-em.cpu failed, GDB will be halted. Polling again in 100ms
Enabling lmt core tap
Polling target arc-em.cpu failed, GDB will be halted. Polling again in 300ms
Info : JTAG tap: firestarter.lmt enabled
Processor type: arc-em
Polling target arc-em.cpu succeeded again
Info : JTAG tap: firestarter.cltap tap/device found: 0x0e765013 (mfg: 0x009, part: 0xe765, ver: 0x0)
Enabling arc core tap
Info : JTAG tap: firestarter.arc-em enabled
Enabling lmt core tap
Info : JTAG tap: firestarter.lmt enabled
target state: halted
target halted due to debug-request at 0x40016552 in protected mode
target state: halted
target halted due to debug-request at 0x0000ffff in real mode
target state: halted
adapter speed: 3 kHz
adapter speed: 4000 kHz
Info : JTAG tap: firestarter.cltap tap/device found: 0x0e765013 (mfg: 0x009, part: 0xe765, ver: 0x0)
Enabling arc core tap
Info : JTAG tap: firestarter.arc-em enabled
Enabling lmt core tap
Info : JTAG tap: firestarter.lmt enabled
target state: halted
target halted due to debug-request at 0x0000ffff in real mode
target state: halted
force hard breakpoints
.....40140 bytes written at address 0x40000000
downloaded 40140 bytes in 5.584907s (7.019 KiB/s)
.....32604 bytes written at address 0x40034000
downloaded 32604 bytes in 4.430485s (7.187 KiB/s)
.....131072 bytes written at address 0x40010000
downloaded 131072 bytes in 17.534737s (7.300 KiB/s)
.....16384 bytes written at address 0x40030000
downloaded 16384 bytes in 2.215242s (7.223 KiB/s)
....7168 bytes written at address 0xfffffe400
downloaded 7168 bytes in 1.107622s (6.320 KiB/s)
verified 40140 bytes in 0.140402s (279.193 KiB/s)
verified 32604 bytes in 0.109202s (291.568 KiB/s)
verified 131072 bytes in 0.468009s (273.499 KiB/s)
verified 16384 bytes in 0.062401s (256.406 KiB/s)
verified 7168 bytes in 0.031201s (224.352 KiB/s)
target running
shutdown command invoked

!!!SUCCESS!!!
Press any key to continue . . .
```

Firmware Update using JTAG through J-Link EDU

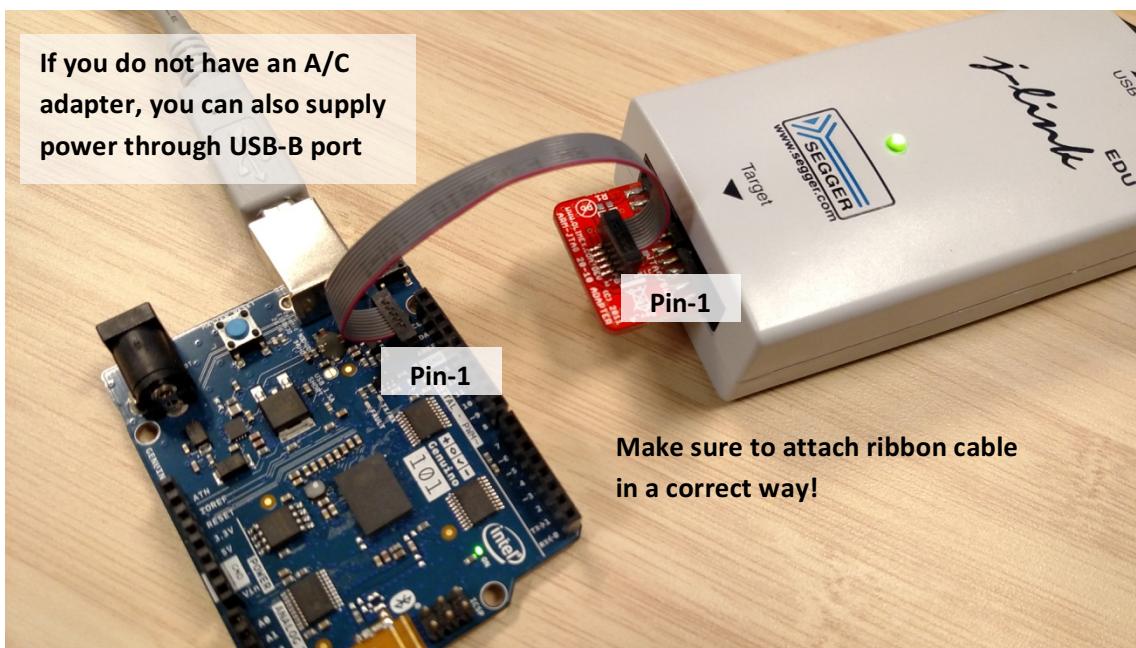
1. Connect all wires as shown on the picture



Components listing:

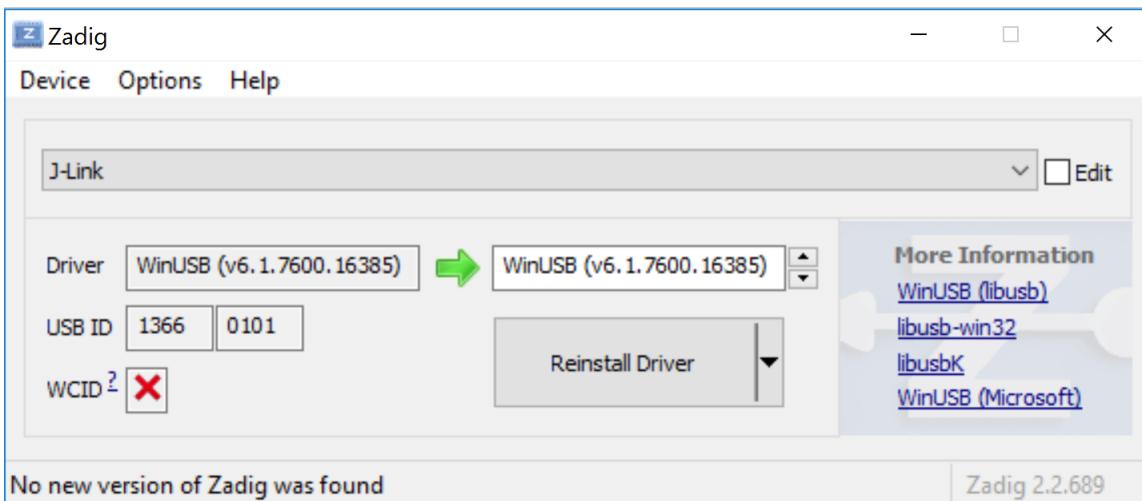
- Windows/Linux/macOS computer
- J-Link EDU probe with USB cable
- Olimex 20 to 10 pin adapter with ribbon cable
- Arduino 101 board with 7-17V DC power supply (or USB-B cable)

Make sure to attach ribbon cable in a correct way, as shown on the photo!



2. Install J-Link EDU probe drivers:

2.1 Windows



- a. Plug in J-Link EDU probe to the host
- b. Download and extract the latest firmware release
- c. Go to bin\ directory, run zadig_2.1.1.exe
- d. Options > List all devices.
- e. Select your probe (J-Link), pick WinUSB and hit Reinstall Driver
- f. Close Zadig and **REPLUG THE PROBE**

2.2 Linux

By default, non-root users won't have access to the JTAG pods connected via USB. You must grant write access to the proper /dev/bus/usb entry every time a device is connected to be able to run OpenOCD using a non-root account. The process can be automated by adding an udev rule. Simply create a text file in the rules directory:

```
$ sudo vim /etc/udev/rules.d/99-openocd.rules
```

The IDs depend on the JTAG device. For example, for the Flyswatter2* and the Olimex-ARM-USB-OCD-H, the rules file must have the following content:

```
SUBSYSTEM=="usb", ATTR{idVendor}=="0403", ATTR{idProduct}=="6010", MODE="0666"
SUBSYSTEM=="usb", ATTR{idVendor}=="15ba", ATTR{idProduct}=="002b", MODE="0666"
```

(See drivers/rules.d/99-openocd.rules)

You can also try flashing with sudo.

2.3 macOS

Download and install FTDI-D2XX driver: <http://www.ftdichip.com/Drivers/D2XX.htm>

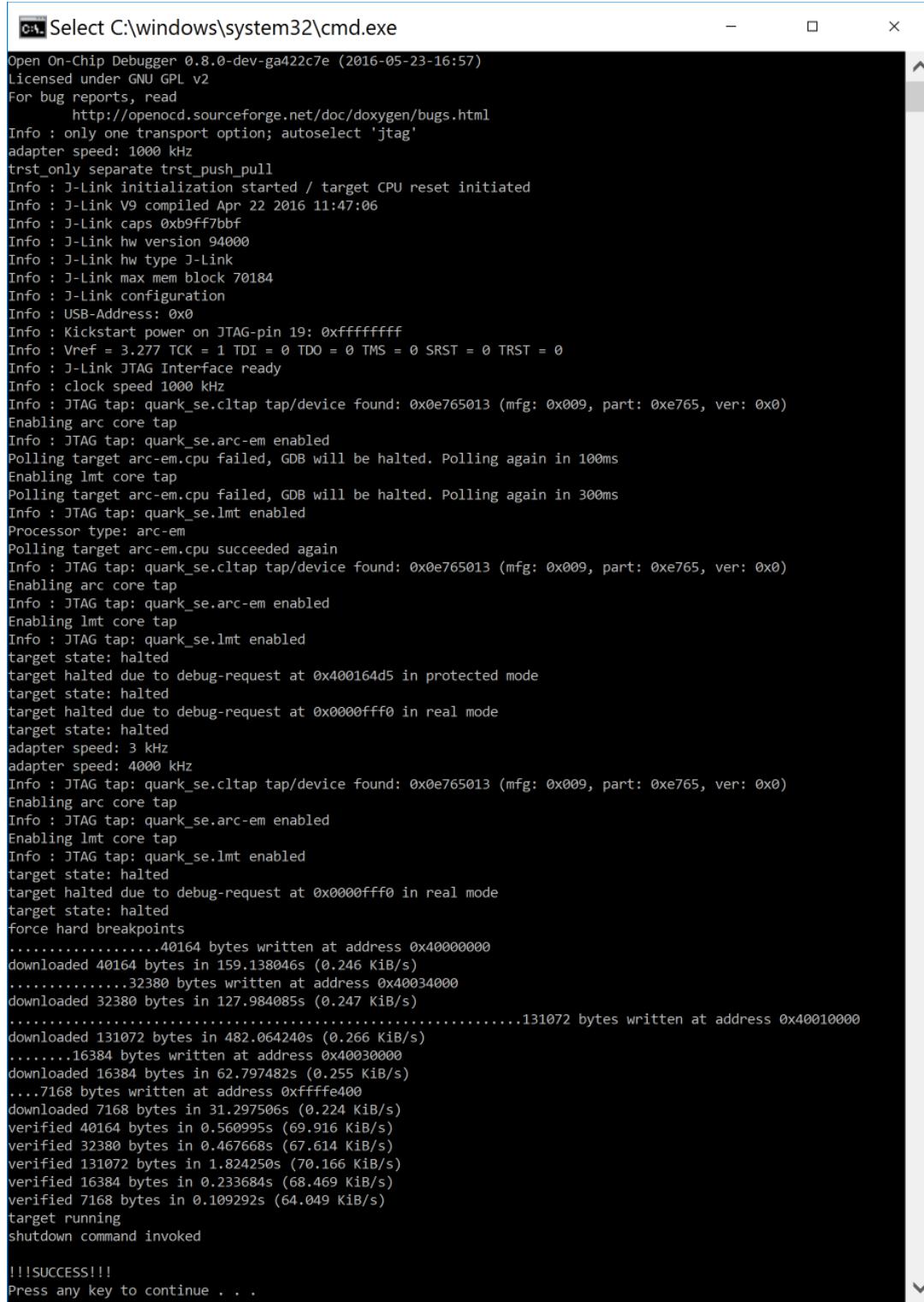
You may need to unload FTDI-VCP driver. See the included OSX-FTDI-Fix.sh and run it with sudo prior to flashing.

3 Flash the firmware

In the extracted flash pack directory, run the flashing script:

- **Windows:** Execute (double-click) **flash_jlink.bat** in order to flash production image.
- **Linux & macOS:** Run **flash_jlink.sh** in order to flash production image

Below is what a successful flash looks like. Flashing takes about 20 minutes.



```

Select C:\windows\system32\cmd.exe

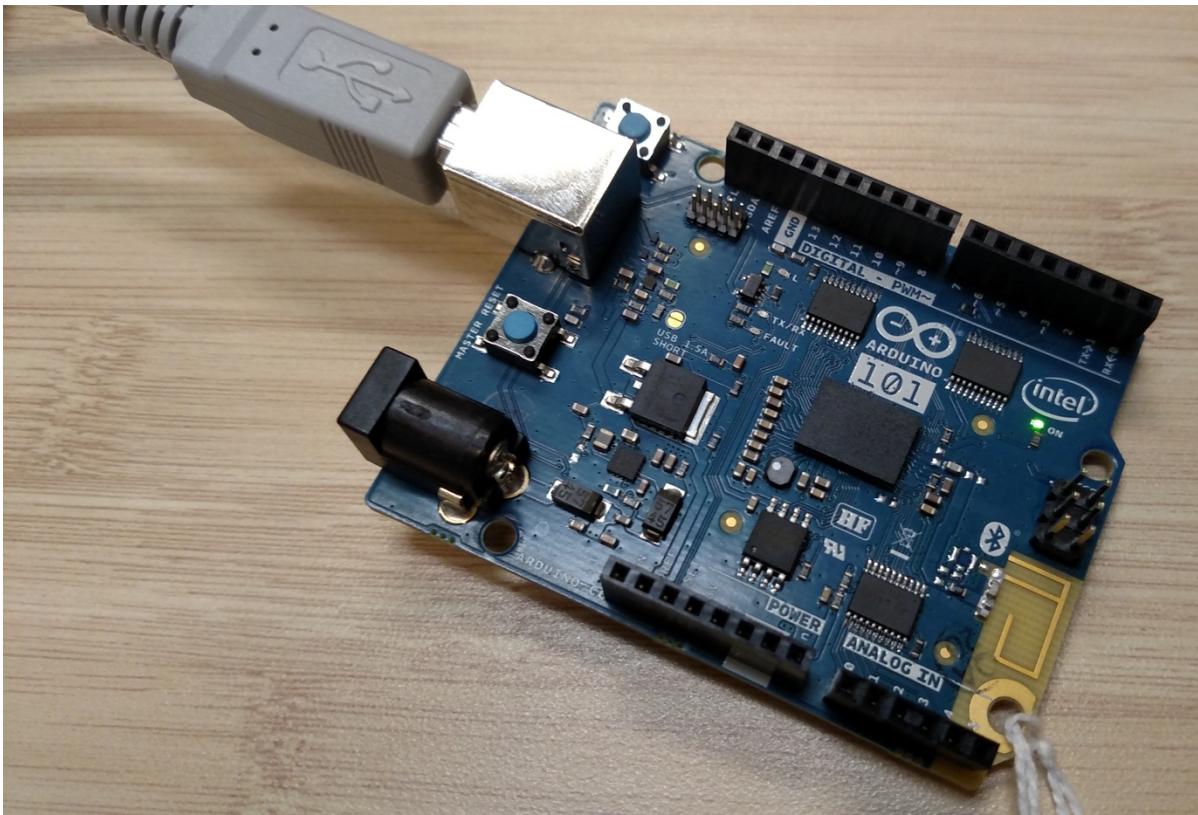
Open On-Chip Debugger 0.8.0-dev-ga422c7e (2016-05-23-16:57)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.sourceforge.net/doc/doxygen/bugs.html
Info : only one transport option; autoselect 'jtag'
adapter speed: 1000 kHz
trst_only separate trst_push_pull
Info : J-Link initialization started / target CPU reset initiated
Info : J-Link V9 compiled Apr 22 2016 11:47:06
Info : J-Link caps 0xb9ff7bbf
Info : J-Link hw version 94000
Info : J-Link hw type J-Link
Info : J-Link max mem block 70184
Info : J-Link configuration
Info : USB-Address: 0x0
Info : Kickstart power on JTAG-pin 19: 0xffffffff
Info : Vref = 3.277 TCK = 1 TDI = 0 TDO = 0 TMS = 0 SRST = 0 TRST = 0
Info : J-Link JTAG Interface ready
Info : clock speed 1000 kHz
Info : JTAG tap: quark_se.cltap tap/device found: 0x0e765013 (mfg: 0x009, part: 0xe765, ver: 0x0)
Enabling arc core tap
Info : JTAG tap: quark_se.arc-em enabled
Polling target arc-em.cpu failed, GDB will be halted. Polling again in 100ms
Enabling lmt core tap
Polling target arc-em.cpu failed, GDB will be halted. Polling again in 300ms
Info : JTAG tap: quark_se.lmt enabled
Processor type: arc-em
Polling target arc-em.cpu succeeded again
Info : JTAG tap: quark_se.cltap tap/device found: 0x0e765013 (mfg: 0x009, part: 0xe765, ver: 0x0)
Enabling arc core tap
Info : JTAG tap: quark_se.arc-em enabled
Enabling lmt core tap
Info : JTAG tap: quark_se.lmt enabled
target state: halted
target halted due to debug-request at 0x400164d5 in protected mode
target state: halted
target halted due to debug-request at 0x0000ffff in real mode
target state: halted
force hard breakpoints
.....40164 bytes written at address 0x40000000
downloaded 40164 bytes in 159.138046s (0.246 KiB/s)
.....32380 bytes written at address 0x40034000
downloaded 32380 bytes in 127.984085s (0.247 KiB/s)
.....131072 bytes written at address 0x40010000
downloaded 131072 bytes in 482.064240s (0.266 KiB/s)
.....16384 bytes written at address 0x40030000
downloaded 16384 bytes in 62.797482s (0.255 KiB/s)
.....7168 bytes written at address 0xfffffe400
downloaded 7168 bytes in 31.297506s (0.224 KiB/s)
verified 40164 bytes in 0.560995s (69.916 KiB/s)
verified 32380 bytes in 0.467668s (67.614 KiB/s)
verified 131072 bytes in 1.824250s (70.166 KiB/s)
verified 16384 bytes in 0.233684s (68.469 KiB/s)
verified 7168 bytes in 0.109292s (64.049 KiB/s)
target running
shutdown command invoked

!!!SUCCESS!!!
Press any key to continue . . .

```

Firmware Update using USB

1. Connect USB cable to board as shown



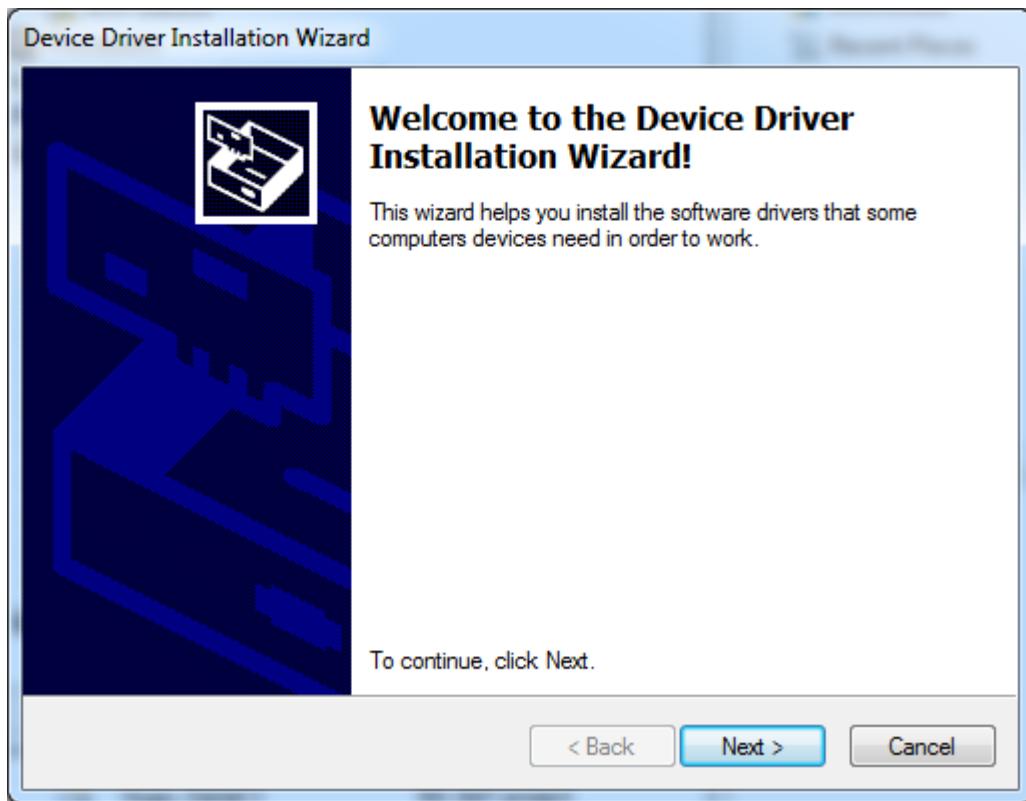
Components listing:

- a. Windows/Linux/macOS computer
- b. USB cable
- c. Arduino 101 board
- d. 7-17V DC power supply (or USB-B cable)

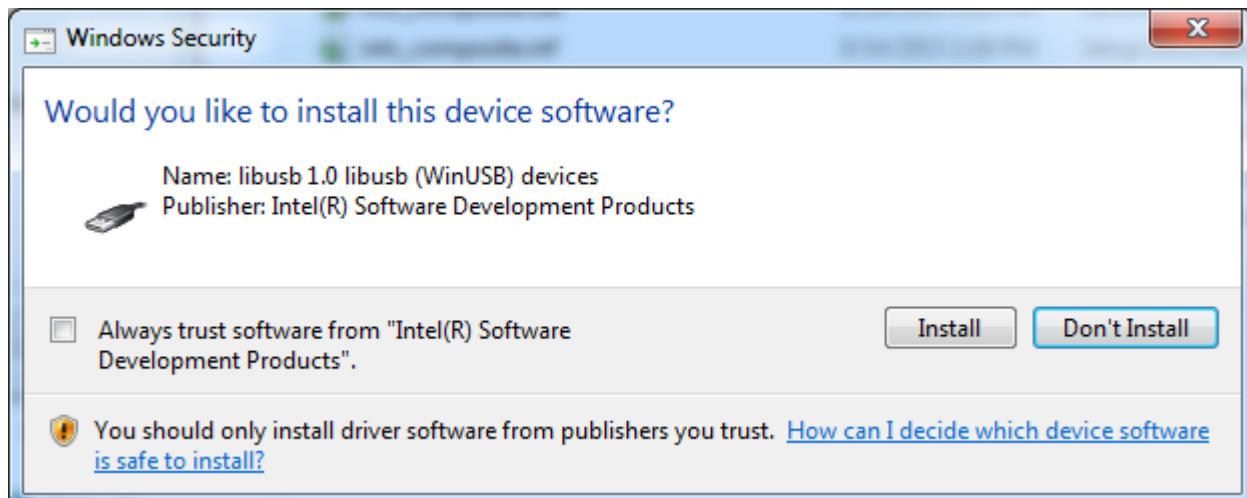
2. Install drivers

2.1. Windows

- a. Download and extract the latest firmware release
- b. In the extracted flash pack directory, go to `drivers\Windows\` directory and run
 - `dpinst-amd64.exe` on 64-bit Windows
 - `dpinst-x86.exe` on 32-bit Windows



- c. Click Next



- d. Click **Install**



e. Click **Finish**

2.2. Linux

The DFU device can be set up for use by regular users by editing a text file in the rules directory.

Enter **ONE RULE PER LINE**. Newline characters are not allowed.

```
udo vi /etc/udev/rules.d/99-dfu.rules
```

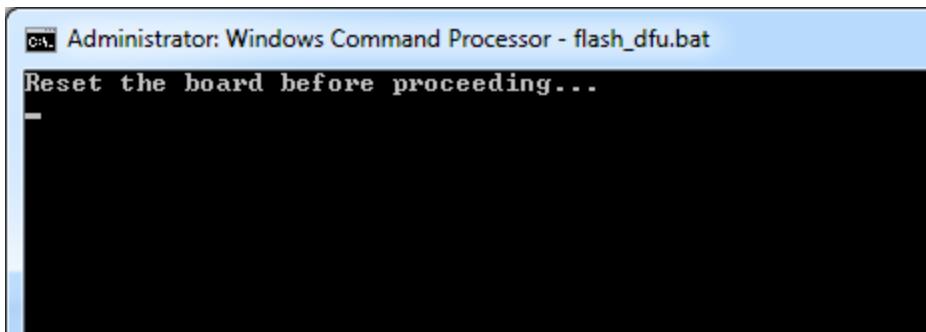
```
# Arduino 101 in DFU Mode
SUBSYSTEM=="tty", ENV{ID_REVISION}=="8087", ENV{ID_MODEL_ID}=="0ab6", MODE=="0666", ENV{ID_MM_DEVICE_IGNORE}="1", ENV{ID_MM_CANDIDATE}="0"
SUBSYSTEM=="usb", ATTR{idVendor}=="8087", ATTR{idProduct}=="0aba", MODE=="666", ENV{ID_MM_DEVICE_IGNORE}="1"
```

(See `drivers/rules.d/99-dfu.rules`)

3. Flash the firmware

In the extracted flash pack directory, run the flashing script:

- **Windows:** Execute (double-click) **flash_dfu.bat** in order to flash production image.
- **Linux & macOS:** Run **flash_dfu.sh** in order to flash production image



3.1 Press the **reset** button on the board to start the flash process

Below is what a successful DFU flash looks like. Flashing takes about a minute.

```
on C:\windows\system32\cmd.exe
Opening DFU capable USB device...
ID 8087:0aba
Run-time device DFU version 0011
Claiming USB DFU Interface...
Setting Alternate Setting #7 ...
Determining device status: state = dfuIDLE, status = 0
dfuIDLE, continuing
DFU mode device DFU version 0011
Device returned transfer size 2048
Copying data from PC to DFU device
Download      [=====] 100%          32604 bytes
Download done.
state(2) = dfuIDLE, status(0) = No error condition is present
Done!
dfu-util 0.8

Copyright 2005-2009 Weston Schmidt, Harald Welte and OpenMoko Inc.
Copyright 2010-2014 Tormod Volden and Stefan Schmidt
This program is Free Software and has ABSOLUTELY NO WARRANTY
Please report bugs to dfu-util@lists.gnu.org

Invalid DFU suffix signature
A valid DFU suffix will be required in a future dfu-util release!!!
Opening DFU capable USB device...
ID 8087:0aba
Run-time device DFU version 0011
Claiming USB DFU Interface...
Setting Alternate Setting #8 ...
Determining device status: state = dfuIDLE, status = 0
dfuIDLE, continuing
DFU mode device DFU version 0011
Device returned transfer size 2048
Copying data from PC to DFU device
Download      [=====] 100%          141636 bytes
Download done.
state(2) = dfuIDLE, status(0) = No error condition is present
Done!
can't detach
Resetting USB to switch back to runtime mode

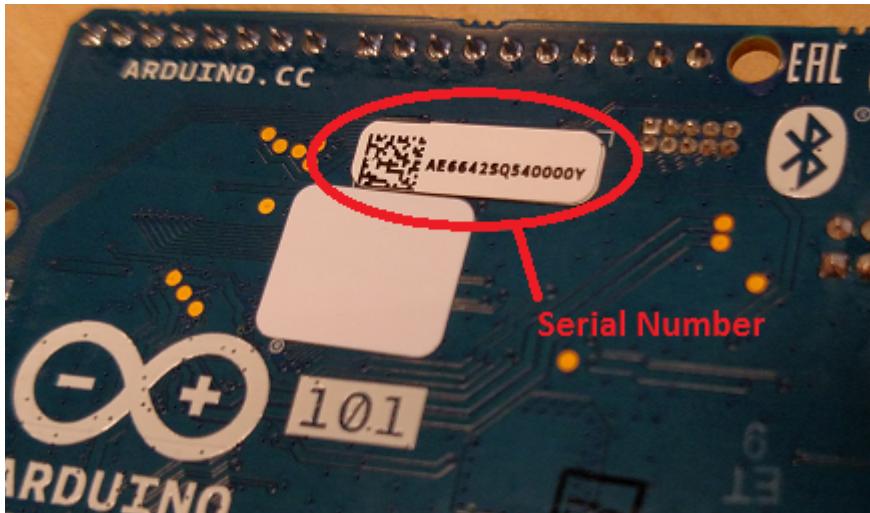
---SUCCESS---
Press any key to continue . . .
```

Appendix

1. Flashing Multiple Arduino101 Boards Simultaneously

By default, users can flash to only one board at a time. If more than one DFU device is visible to the host system, an error will occur. When flashing firmware to multiple boards at the same time, specify a serial number.

- a. Get the board serial number:



- b. Specify the serial number when running the flash_dfu script:

- i. Linux

e.g.,

```
flash_dfu.sh AE642SQ34000Y
```

- ii. Windows

e.g.,

```
flash_dfu.bat AE642SQ34000Y
```