# TG056: REPROGRAMMING GUIDE – GENERAL PURPOSE DRIVER AND SMART PUMP MODULE

# 1. INTRODUCTION

## 1.1. About this Technical Guide

Updating the firmware may be required to enable new functionality and fix bugs. This process is not standard for the Smart Pump Module and may require wires to be temporarily soldered.

This note shows the process for uploading new firmware to the boards. This consists of the following stages:

- Required hardware and software.
- Connecting an external programmer to the boards.
- Uploading new firmware to the boards.

# 2. DISCLAIMER

**This resource is provided "as is" and without any warranty of any kind, and its use is at your own risk. The Lee Company does not warrant the performance or results that you may obtain by using this resource. The Lee Company makes no warranties regarding this resource, express or implied, including as to non-infringement, merchantability, or fitness for any particular purpose. To the maximum extent permitted by law The Lee Company disclaims liability for any loss or damage resulting from use of this resource, whether arising under contract, tort (including negligence), strict liability, or otherwise, and whether direct, consequential, indirect, or otherwise, even if The Lee Company has been advised of the possibility of such damages, or for any claim from any third party**.

# 3. HEALTH AND SAFETY

**WARNING**

The Disc Pump Driver PCB Voltage must not exceed $48V_{r.m.s.}$ (where for a typical square-wave drive $V_{r.m.s.} \approx V_{pk}$) at frequencies between 20 and 22 kHz. It is the user's responsibility to ensure that the Disc Pump Driver PCB is used and/or

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| | integrated within any product in a safe manner. Read the appropriate user manual prior to first operation and take note of all safety notices. |

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|  | **WARNING**<br>Take care during use of the Disc Pump Drive PCB not to create short circuits between exposed conductive parts of the board. Short circuits may lead to malfunctioning and heating. |

## 4. GETTING THE LATEST FIRMWARE

To get the latest version of the firmware please contact your local Lee Sales Engineer.

## 5. HARDWARE AND SOFTWARE SETUP

This document describes two tools that could be used to program the pump control boards:

- Segger J-Link is more expensive and requires no additional hardware.
- ST-Link is a lower cost alternative; however, it is not able to provide sufficient power to the boards, so an external voltage supply is required (Note that the Development Kit and Evaluation Kit can be powered either by USB or by an external mains power supply, which is not included routinely with the Development Kit).

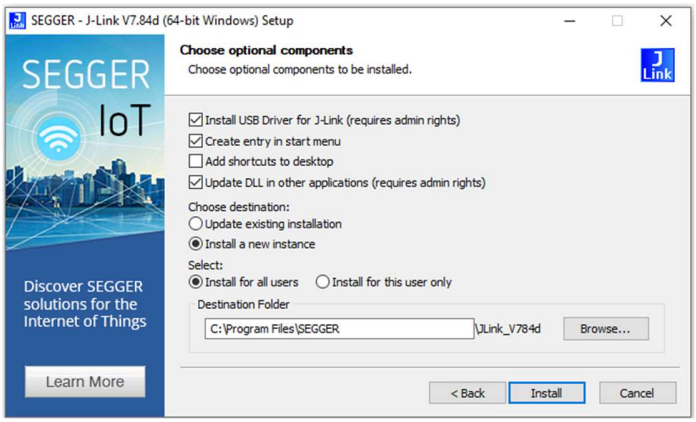
## 5.1. Segger J-Link


J-Link is a debug probe made by Segger (https://www.segger.com/products/debug-probes/j-link/models/j-link-base/).

### 5.1.1. J-Link setup

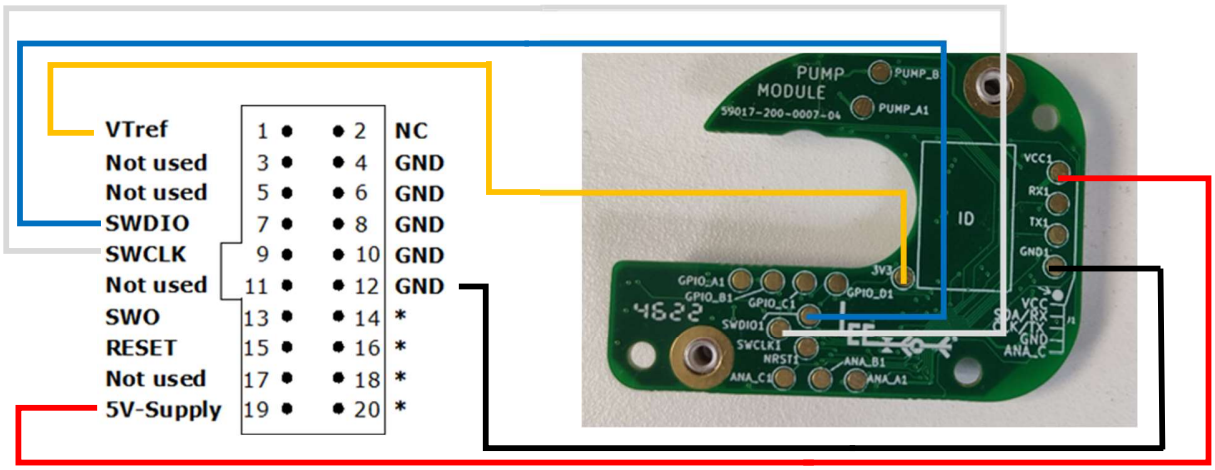
Download and install the J-Link software and documentation pack from Segger's website (https://www.segger.com/downloads/jlink/).

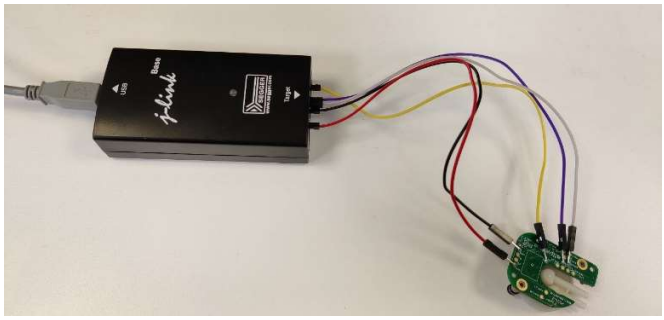
During the installation make sure to select the options to install the USB Driver. This requires admin rights to install.

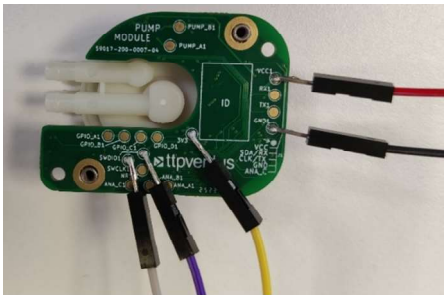


### 5.1.2. J-Link connecting to the Smart Pump Module

The following schematics and pictures show how to connect a J-Link to a Smart Pump Module. The electrical connections are made through the contact pads on the bottom of the module. Ensuring good electrical connection requires soldering or other means of maintaining good mechanical contact. The wires can be removed after the firmware is updated.

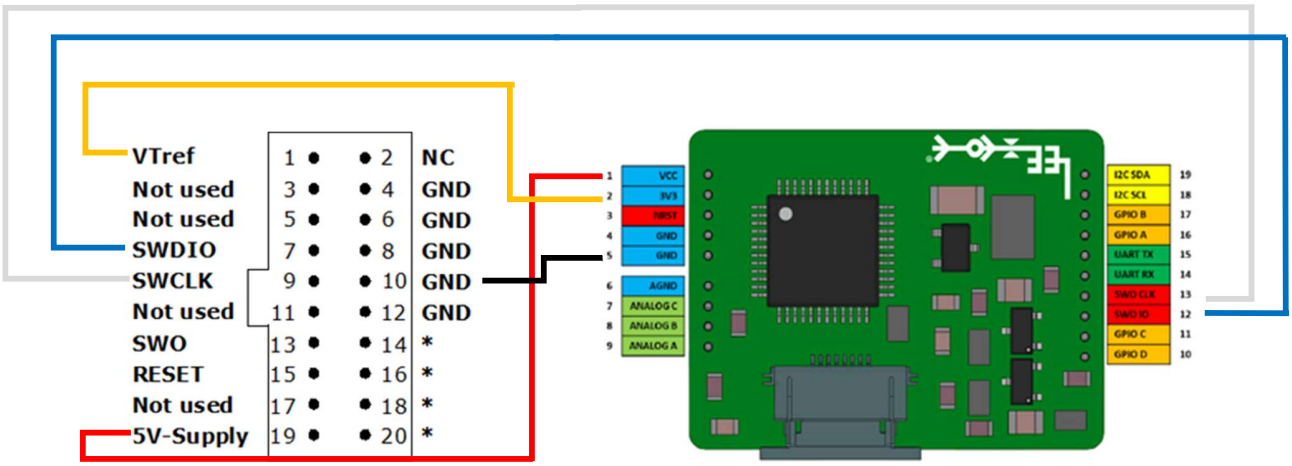


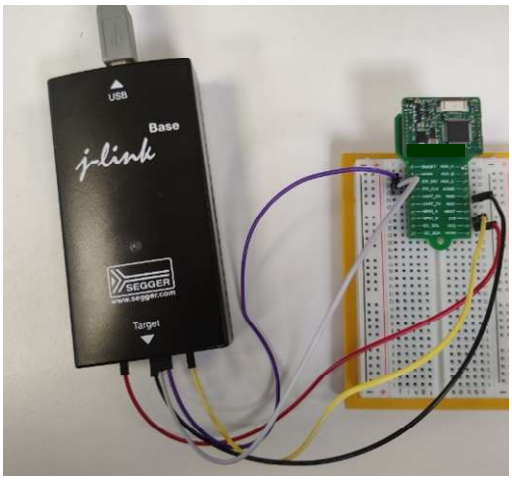



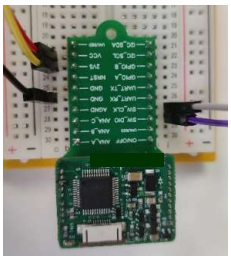
### 5.1.3. J-Link connecting to General Purpose Drive Board

The following schematics and pictures show how to connect a J-Link to a General purpose drive board.



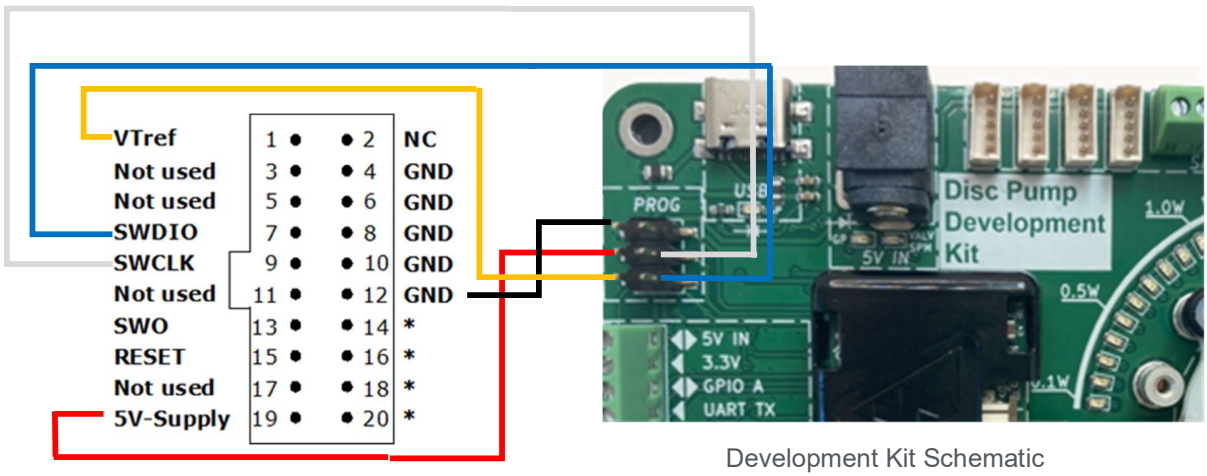





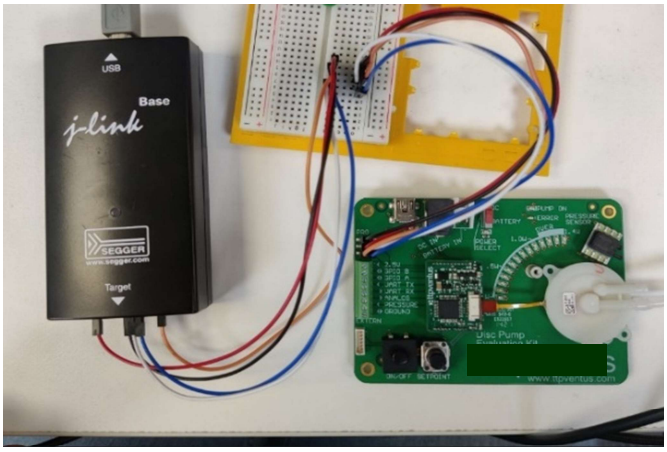


### 5.1.4. J-Link connecting to Development Kit and Evaluation Kit Motherboards

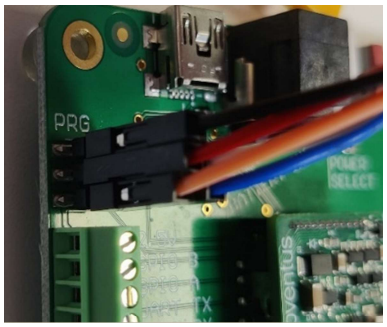
The following schematics and pictures show how to connect a J-Link to a Development Kit or Evaluation Kit Motherboard; the programming pin configurations are identical.

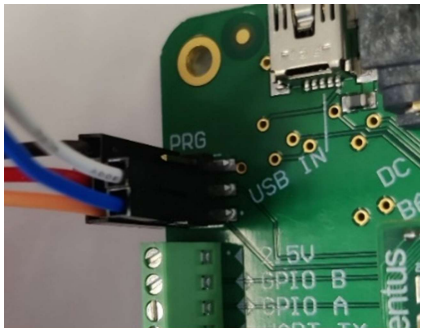



Development Kit Schematic




Evaluation Kit Set Up for Programming

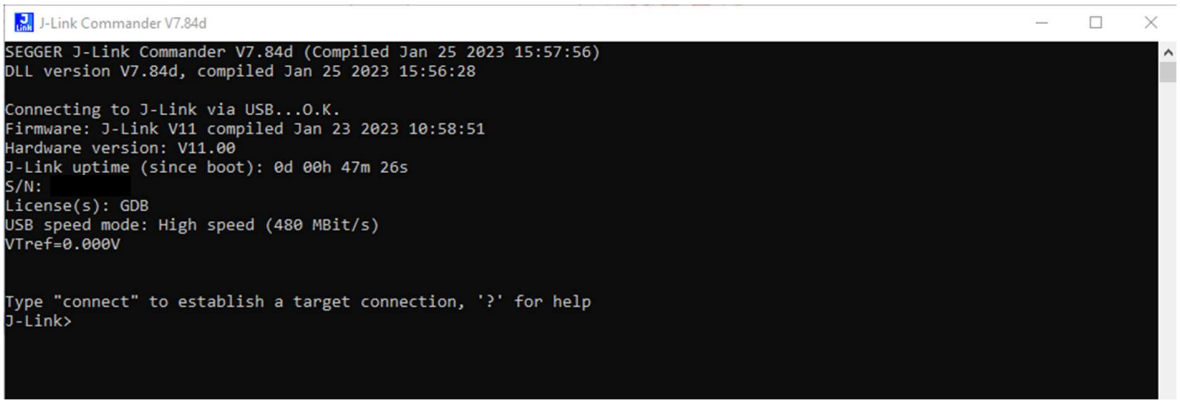



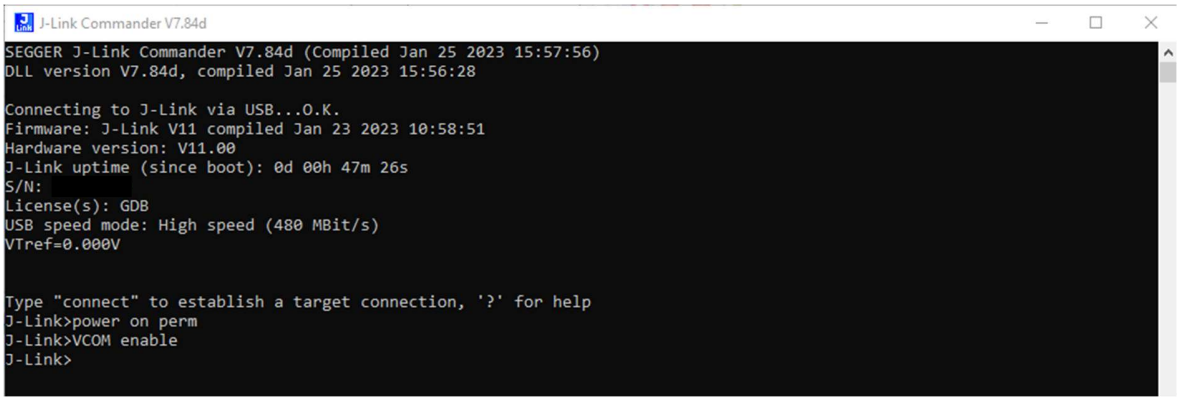
### 5.1.5. J-Link enable 5V output

The 5V output of the J-Link needs to be enabled to power the board for programming. Alternatively, you could connect an external 5V supply, like for the ST-Link.

To enable the J-Link 5V, output connect the J-Link with a USB cable and open the J-Link Commander program by searching for it in the start menu. The J-Link should be automatically recognised:



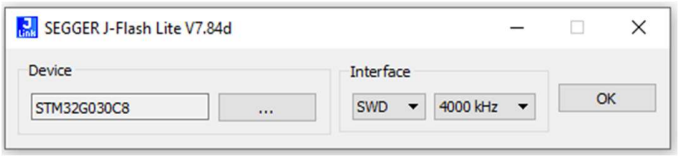

Type in the following two commands “power on perm” and “VCOM enable”. There will be no confirmation of the commands being received:



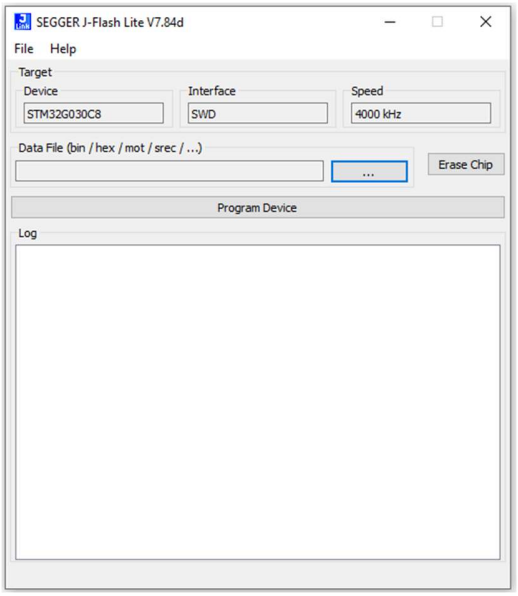

Click Control-C to close the program. Unplug and plug in the J-Link to restart it. The J-Link 5V supply is now enabled. You only have to do this once for each J-Link.

### 5.1.6. J-Link firmware uploading

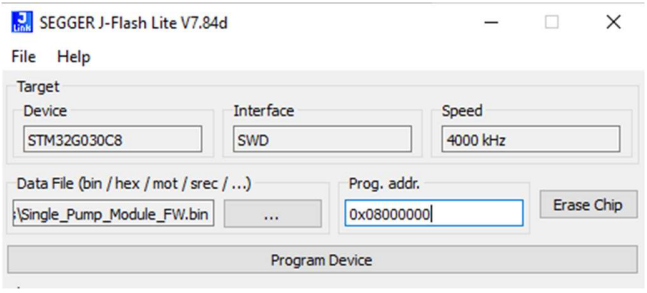
Open the J-Flash Lite program by searching for it in the start menu. Select the STM32G030C8 device and set the interface to SWD at 4000kHz. Click OK to go to the programming screen.




Once you have the programming screen opened, use the three dots to navigate to the binary file (.bin) of the updated firmware.




Once the binary file is selected, set the Program address to 0x08000000.



To upload the new firmware:

1) Click the Erase Chip button. This ensures that there are no leftover settings from the previous version and that the new version can be installed cleanly. The log will confirm the device being erased:

```
Data file contains 57 KB of data.
Connecting to J-Link...
Connecting to target...
Erasing...
Done.
```

2) Click program device. The log will confirm the device being programmed:

```
Conecting to J-Link...
Connecting to target...
Downloading...
Done.
```

The device is now programmed with the latest firmware. Restart the device for the effect to take place. The version of the firmware can be confirmed in the top right corner of the PC application.

## 5.2. ST-Link

ST-Link/V2 is a debug probe made by ST (https://www.st.com/en/development-tools/st-link-v2.html).

### 5.2.1. ST-Link setup

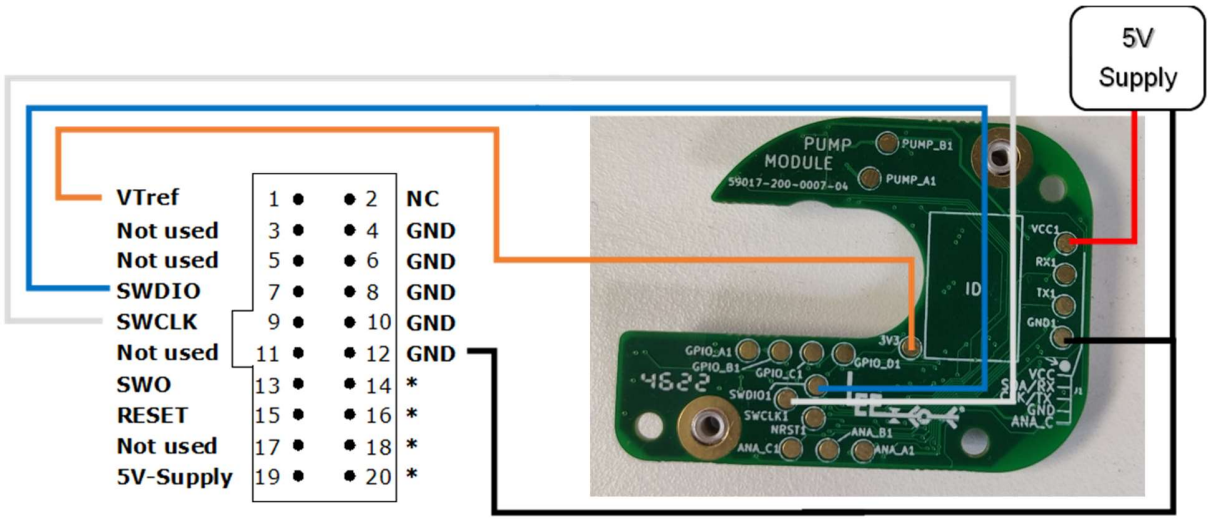
Download and install the STM32 Cube Programmer software from ST's website (https://www.st.com/en/development-tools/stm32cubeprog.html).

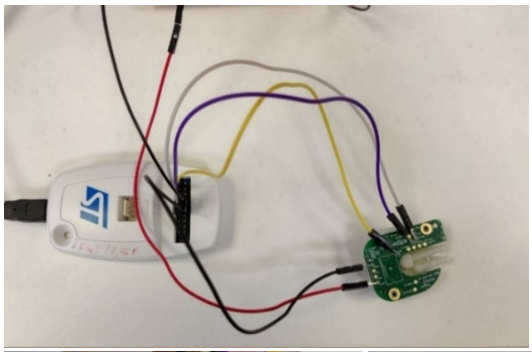
During the installation make sure to select the options to install the USB Driver. This requires admin rights to install.

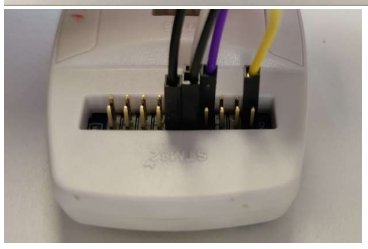
### 5.2.2. ST-Link connecting to Smart Pump Module

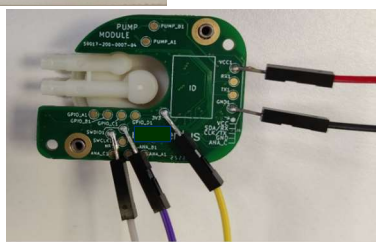
The following schematics and pictures show how to connect an ST-Link to a Smart Pump Module. The electrical connections are made through the contact pads on the bottom of the module. Ensuring good electrical connection requires soldering or other means of maintaining good mechanical contact. The wires can be removed after the firmware is updated.

The power supply pin on the ST-Link can only power the board when the pump is not running so it is recommended to connect an external power supply.



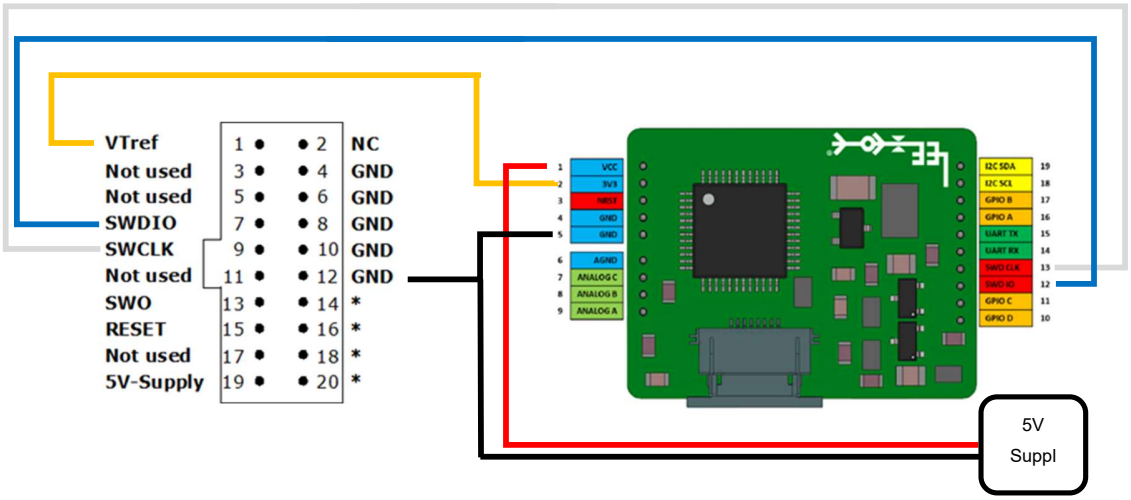



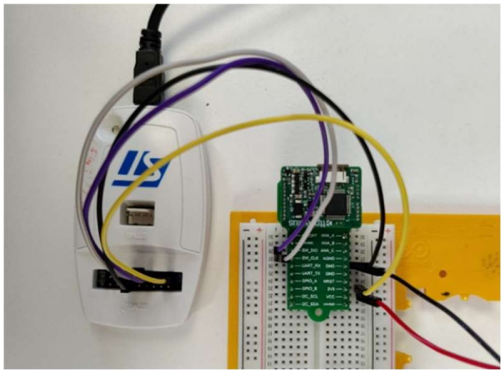


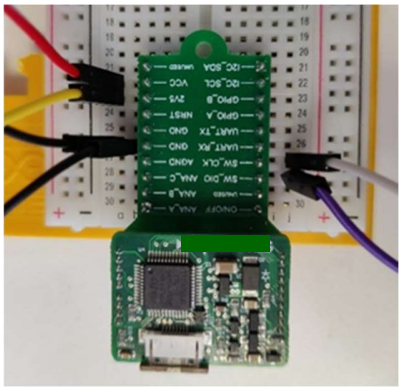


### 5.2.3. ST-Link connecting to a General purpose drive board

The following schematics and pictures show how to connect a ST-Link to a General purpose drive board. The power supply pin on the ST-Link can only power the board when the pump is not running so it is recommended to connect an external power supply.

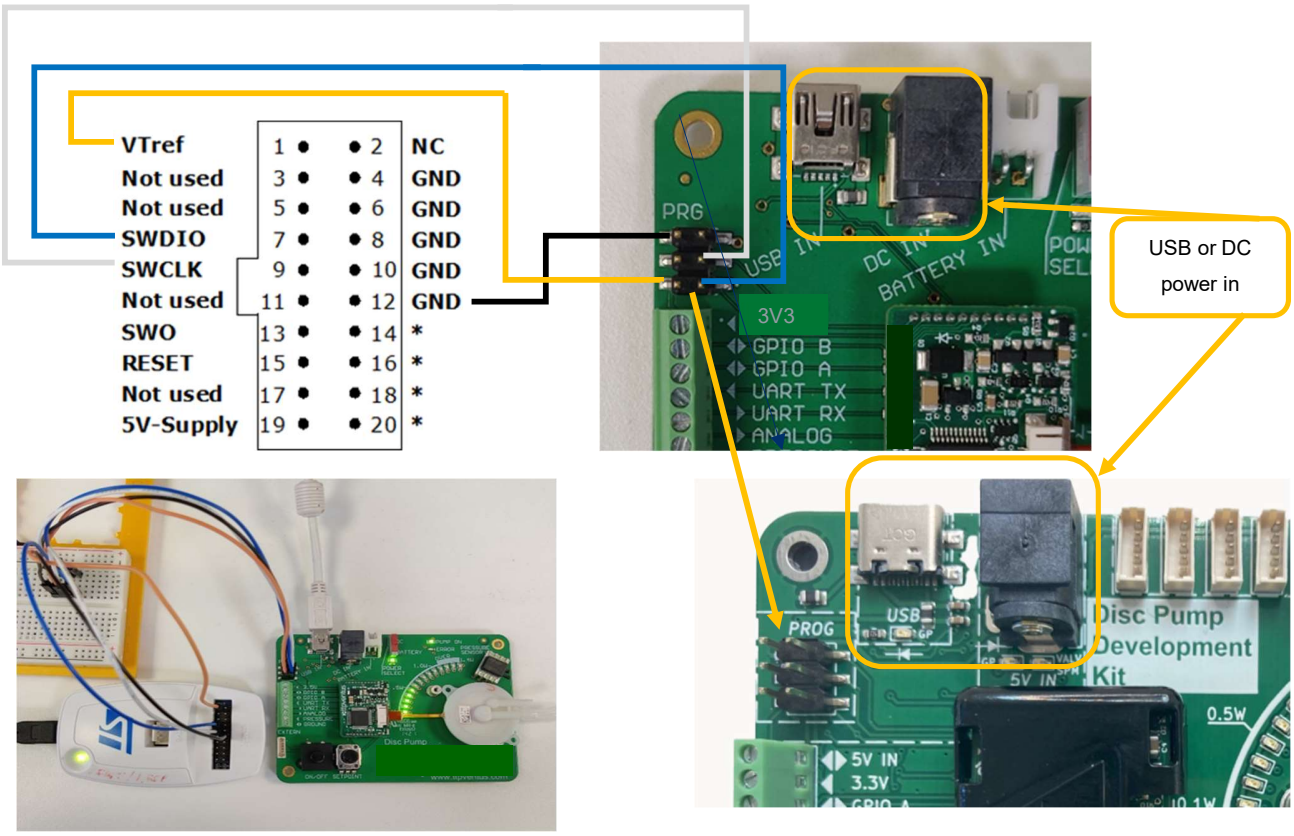




### 5.2.4. ST-Link connecting to Evaluation Kit

The following schematics and pictures show how to connect a ST-Link to an Evaluation Kit and Development Kit Motherboards. The power supply pin on the ST-Link can only power the board when the pump is not running so it is recommended to use the USB in or DC in for power.

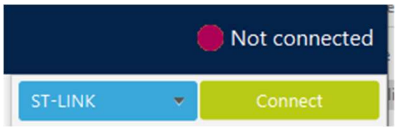



*Note: The above picture uses the breadboard only for connecting same colour cables together. The breadboard is not required to achieve the correct connection.*

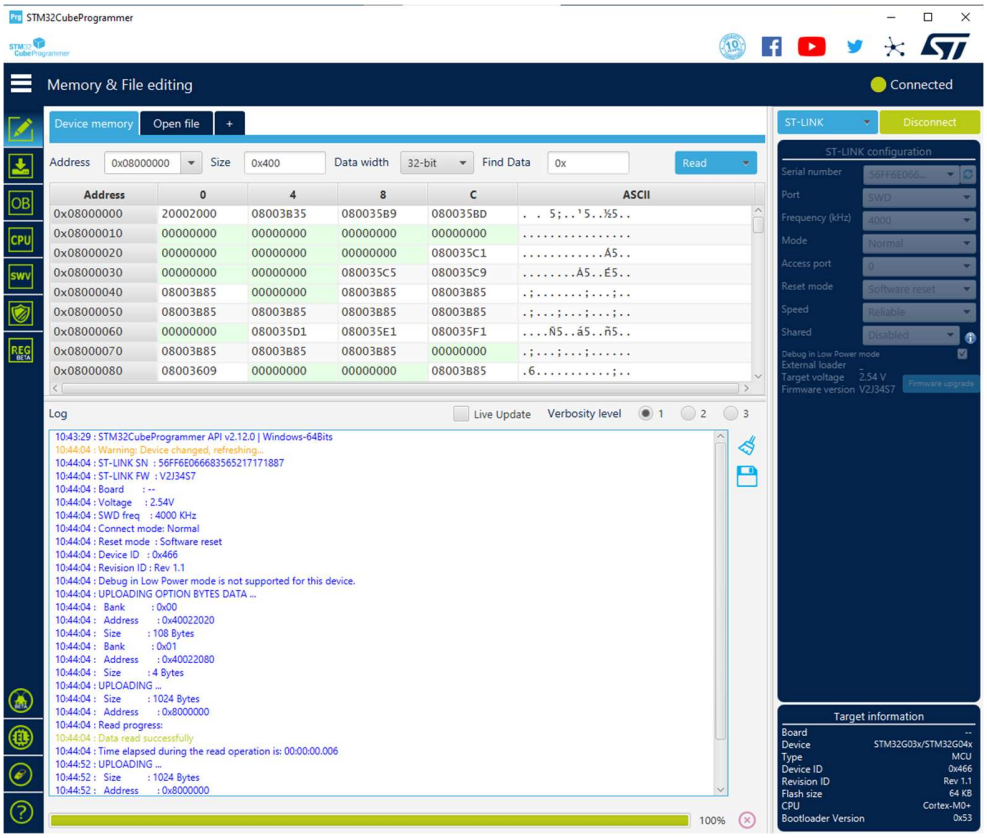
*Note: The USB cable is used to deliver power to the Development Kit or Evaluation kit motherboards.*

### 5.2.5. ST-Link firmware uploading

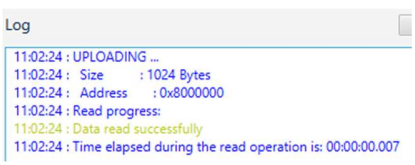
In the first tab click the St-Link connect button. The ST-Link might have connected automatically in which case the button will say disconnect. In this case do not disconnect it. When the ST-Link is connected its light will go from red to green.



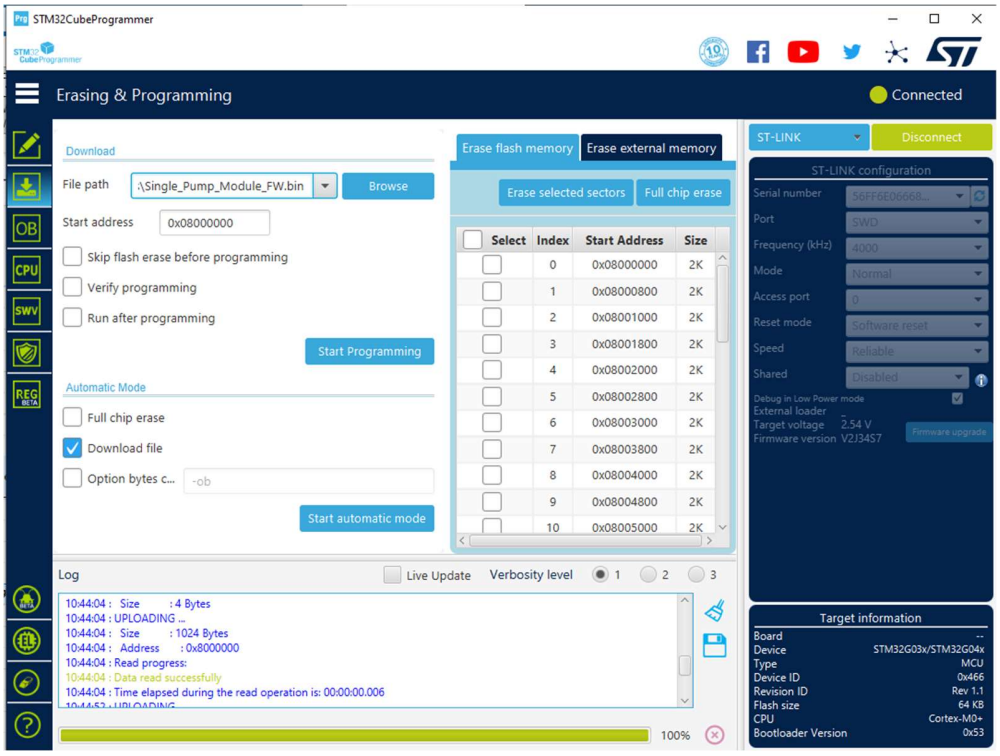

Set the device address to 0x08000000. The ST-Link should automatically recognise the connected device as shown in the bottom right corner. Make sure the device is the STM32G03.




Click the Read button. This establishes the connection with the device. The log will confirm data being read from the device:

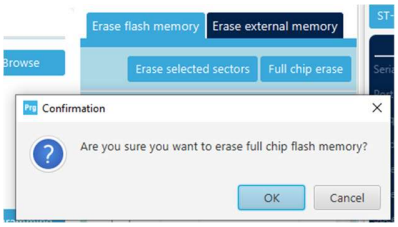


In the second tab navigate to the binary file (.bin) of the updated firmware. Set the start address to 0x08000000.

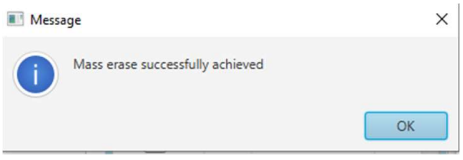



To upload the new firmware:

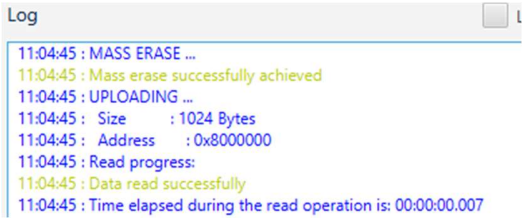
1) Click the Full chip erase button. This ensures that there are no leftover settings from the previous version and that the new version can be installed cleanly. There may be a prompt to confirm:



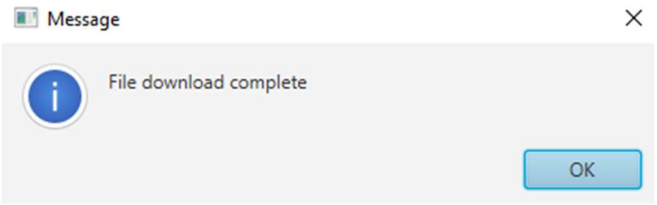

There will be a confirmation of the erase being successful:



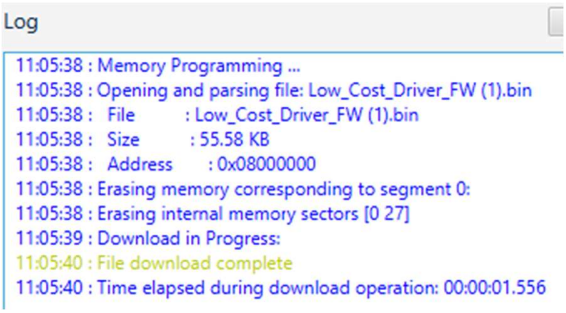
The log will confirm the device being erased:




2) Click Start programming. There will be a confirmation of the programming being successful:




The log will confirm the device being programmed:




The device is now programmed with the latest firmware. Restart the device for the effect to take place. The version of the firmware can be confirmed in the top right corner of the PC application.

# 6. ADDITIONAL SUPPORT

The Lee Company Website (https://www.theleeco.com/disc-pumps/) provides advice on:

- Getting Started
- Applications
- Development Process
- Downloads (including datasheets, manuals, application notes, case studies and 3D models)
- Frequently Asked Questions

The Lee Company is happy to discuss next steps beyond prototyping, including system design. If you would like to discuss this with us, or for any other additional support, please contact your Lee Sales Engineer.

# 7. REVISION HISTORY

| Date | Version | Change |
|---|---|---|
| **05/06/24** | R240605 | Inclusion of Development Kit |
| **03/08/23** | R230803 | Rebranded |
| **25/02/2023** | R230225 | Enabling the 5V output of the J-Link without a using the J-Flash software |
| **31/01/2023** | R230108 | Document created. |