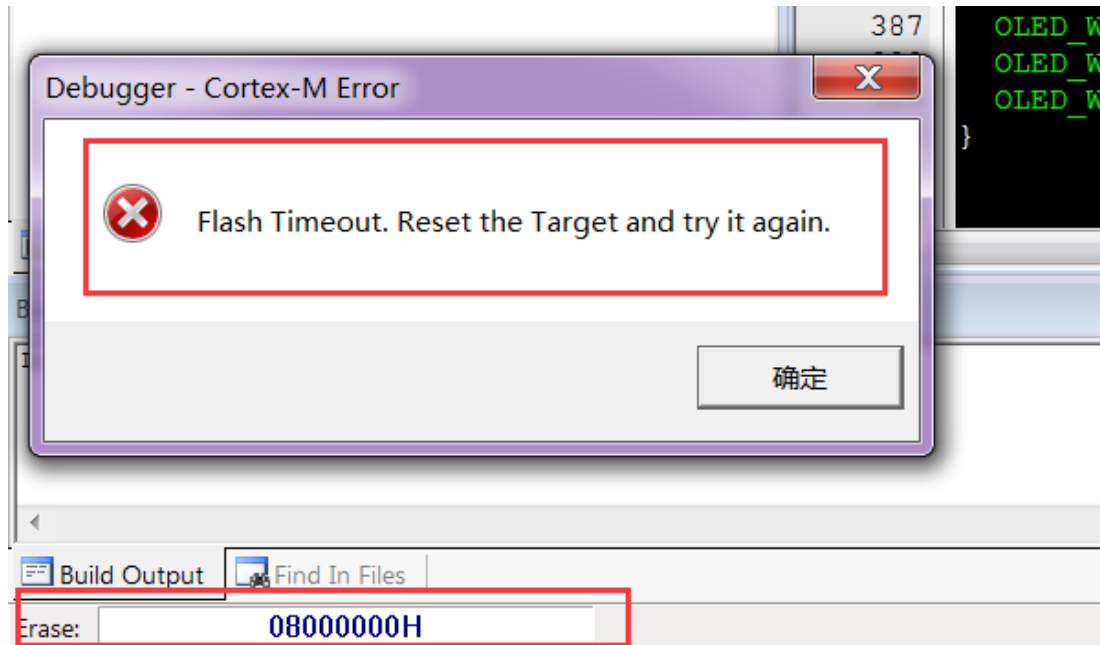


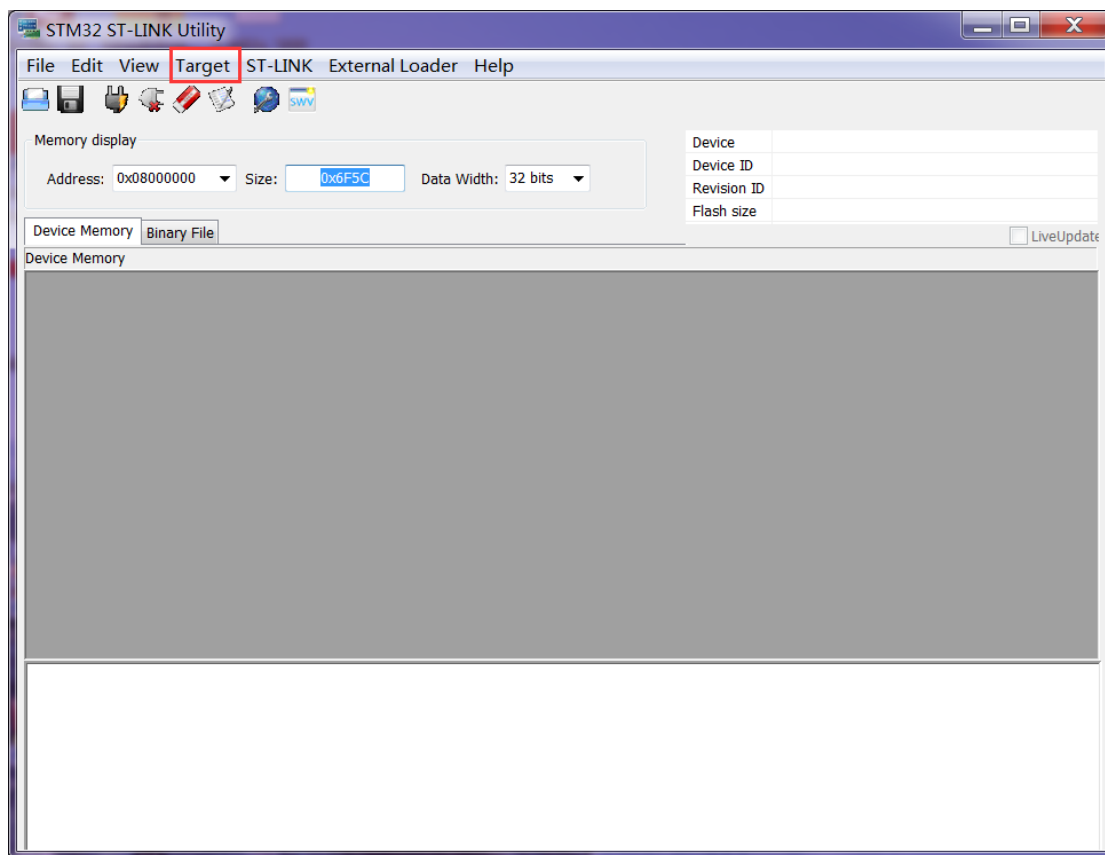
ST-Link 解除读保护说明

开发板使用 SWD 下载程序时,可能会遇到下载异常。当出现如下异常情况时,那可能是主控 IC 的 flash 被设置了读保护,此时无法对 flash 进行读操作,所以不能擦除 flash,程序也就无法下载。

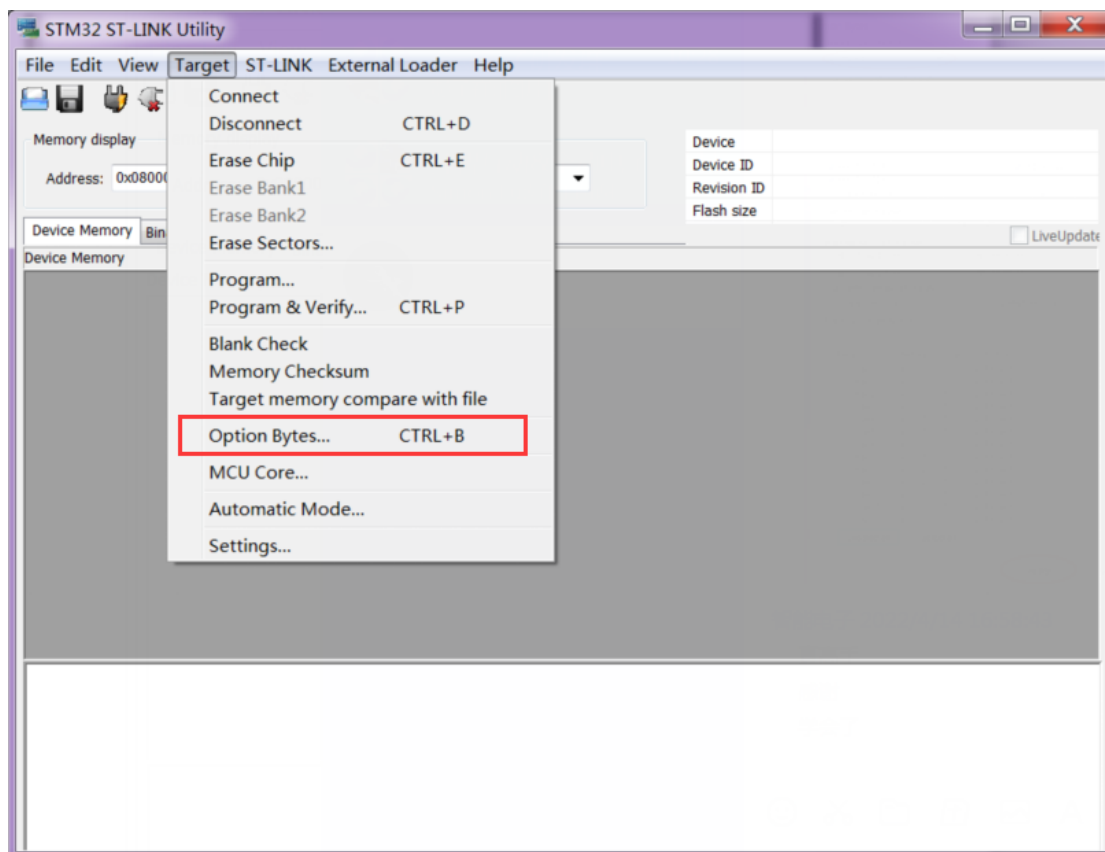


现提供使用 ST-Link 解除主控 IC 读保护的方法说明,步骤如下:

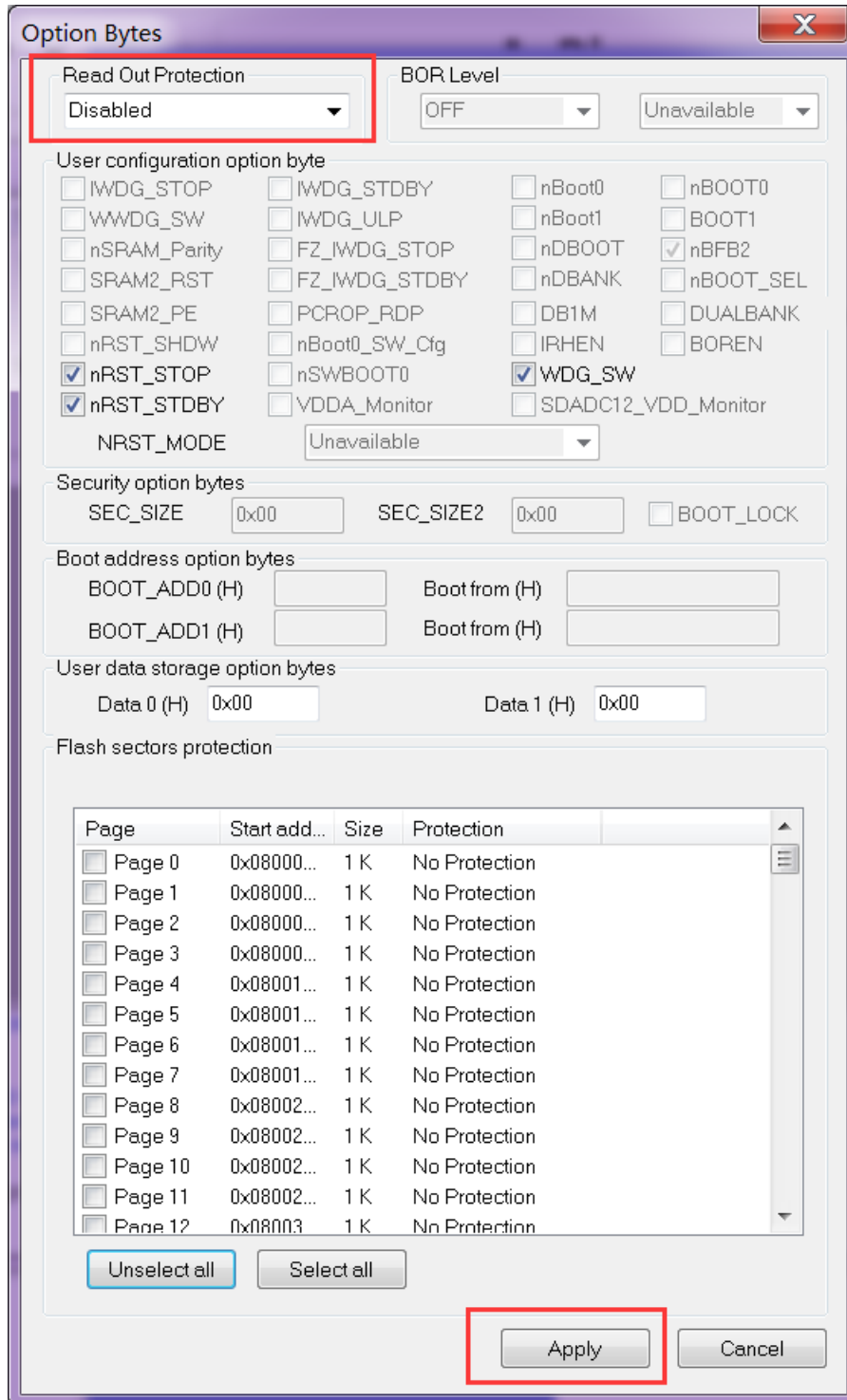
1. 使用 ST-LINK 连接开发板和 PC (具体方法可以查看 SWD 下载之 ST-Link 使用说明 (keil) 文档)
2. 打开 **STM32 ST-LINK Utility** 软件 (需要提前在 PC 机上下载好)
3. 点击软件上的 **Target** 按钮,如下图所示:



4. 在弹出的下拉菜单里点击 **Option Bytes...**按钮，如下图所示：



5. 在弹出来的界面里将 **Read Out Protection** 由 **Enabled** 改为 **Disabled**，然后点击 **Apply** 按钮，如下图所示：



6. 出现如下界面，就说明读保护解除成功，接下来就可以使用 SWD 方式进行正常下载了。

The screenshot shows the STM32 ST-LINK Utility application window. The title bar reads "STM32 ST-LINK Utility". The menu bar includes "File", "Edit", "View", "Target", "ST-LINK", "External Loader", and "Help". Below the menu bar is a toolbar with various icons. The "Memory display" section shows "Address: 0x08000000", "Size: 0x6F5C", and "Data Width: 32 bits". To the right, a table displays device information:

Device	STM32F10xx Medium-density
Device ID	0x410
Revision ID	Rev B
Flash size	Unknown

Below this, it says "Device Memory @ 0x08000000 : Binary File" and "LiveUpdate" checkbox. The main area is a "Target memory, Address range: [0x08000000 0x08006F5C]" table:

Address ...	0	4	8	C	ASCII
0x08000000	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000010	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000020	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000030	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000040	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000050	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000060	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000070	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000080	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	
0x08000090	FFFFFFFF	FFFFFFFF	FFFFFFFF	FFFFFFFF	

At the bottom, a log window shows the following messages:

```

14:37:59 : ST-LINK SN : 53FF71067766485259261681
14:37:59 : V2J31S7
14:37:59 : Connected via SWD.
14:37:59 : SWD Frequency = 4,0 MHz.
14:37:59 : Connection mode : Normal.
14:37:59 : Debug in Low Power mode enabled.
14:37:59 : Device ID:0x410
14:37:59 : Device family :STM32F10xx Medium-density
14:43:21 : Option bytes updated successfully.
    
```