

QL Flash Image Tool User Guide

Introduction

The QuickLogic Flash Image software is a standalone application to flash the ULPSH device.

Purpose

The objective of this document is to provide guidelines on the flash image transfer application and its various user interface options to flash the device.

Scope

This document is intended for the application programmers, device test engineers and for any Engineer who flashes the device.

It will not cover the procedures to build various binary images. You should refer the respective build tools' user guide to build the binary image.

Prerequisites

The following software prerequisites should be installed in the machine before using this software.

- Microsoft® Windows® 7 or 8 (or higher) 64 bit
- J-Link driver 5.02 (or higher)
- Install appropriate UART cable driver supported for the OS version.
- Install Python 3.4 (or above).

Add python install directory, Python34 and Python34\Scripts into the system path variable.

Install pyserial module by executing '*python -m pip install pyserial*' in the command prompt.

How to use the Software

The software can communicate with the device using either JTAG or UART.

JTAG connection:

In JTAG mode the device gets connected to the tool automatically once the 'Start' button is clicked. Make sure the J-Link cable is connected and the required driver software is installed as described in the Prerequisites.

UART connection:

A serial communication should initially be set up between the tool and the device in the UART mode. BL code has the serial protocol defined and certain predefined handshake signals to establish the connection with the tool before actual file transfer. When the flash tool is launched, it tries to establish a connection with the device by polling with continuous handshake signals. The device can then be in the following mode:

1. **Boot mode:** This mode is active when the device has only the BL code in it. The device will continually wait for the handshake from the flash tool. Once the handshake is received, the device is ready to send image to the tool.
2. **M4 APP Mode:** In this mode, the M4 APP will be running in the device. The APP should contain the code to periodically check for the handshake from flash tool.

Once the handshake is received, a reboot command is issued to switch to Boot Mode which will enable the actual flashing process. The M4 applications run at different speeds. To establish the initial connection, user should provide the currently running M4 APP's baud-rate in the edit-box 'Baud Rate'. The default value, *115200* will automatically appear when the tool is opened.

Once image flashing is successful, the tool issues a command to auto-reboot the device.

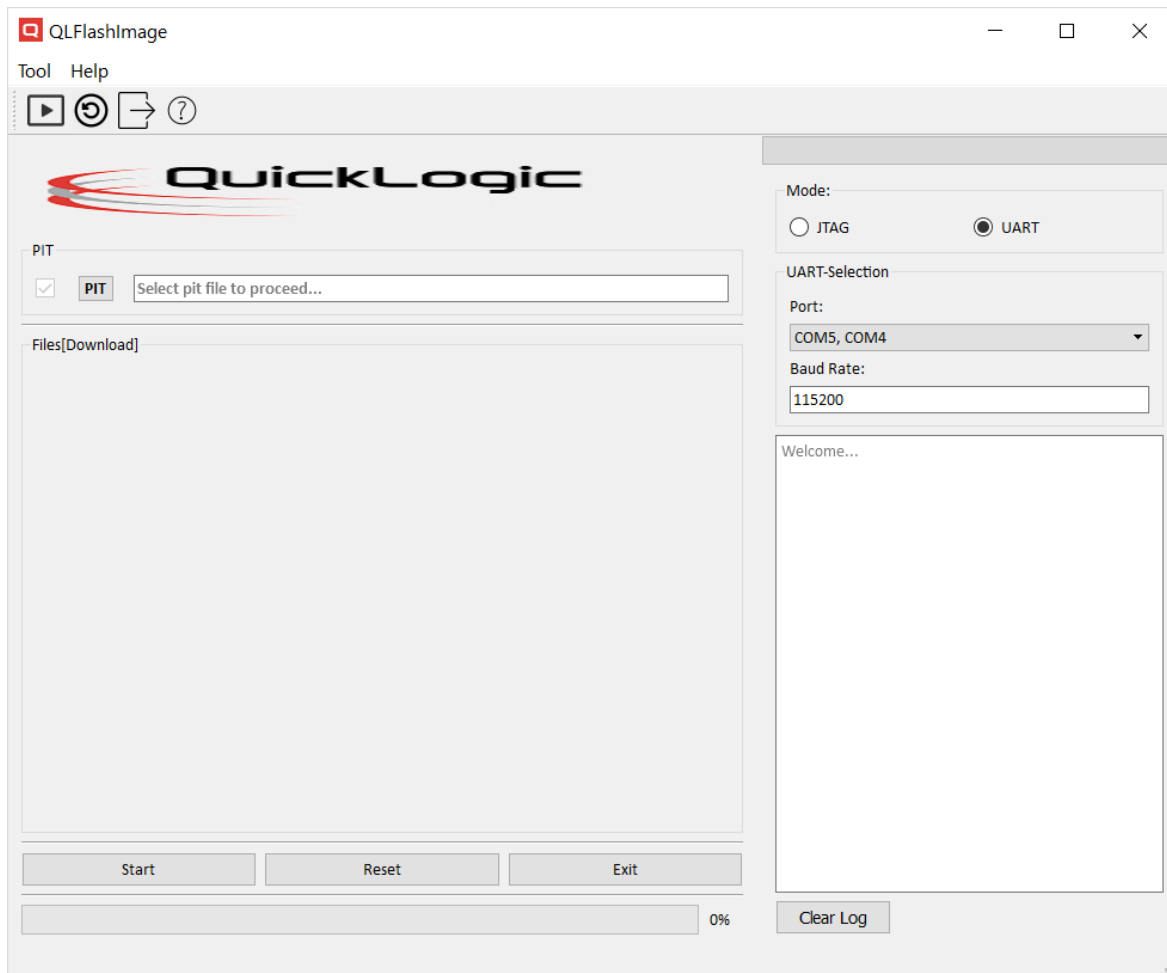


Figure 1: Flash image Transfer Software User Interface

Figure 1 shows the user interface when the application is opened. The interface can be divided into two vertical halves:

On the left: the files selector window. Initially only PIT xml file is enabled.

On the right: the task selector buttons and the log window.

Use one of the buttons given in the bottom of the window to perform the operation.

Start – To start the selected operation

Restart – To reset the window

Exit – To exit the application

PIT xml File:

The PIT (Partition Information Table) file is mandatory to flash the device. PIT is a simple XML file indicating the start offset and the maximum image size for various components. PIT file is used to identify the images to be flashed. PIT file is also required to identify the maximum size and the destination memory offset for the images in the flash.

```
<?xml version="1.0" encoding="utf-8"?>
<PIT>
  <FILE tag = "BL0" size = "0x10000" offset = "0x0" />
  <FILE tag = "OTAFW" size = "0x40000" offset = "0x20000" />
  <FILE tag = "M4APP" size = "0x50000" offset = "0x60000" />
  <FILE tag = "MODEL" size = "0x40000" offset = "0xE0000" />
  <FILE tag = "FFE" size = "0x20000" offset = "0x120000" />
  <FILE tag = "FPGA" size = "0x20000" offset = "0x140000" />
</PIT>
```

tag: a name to identify the image.

size: maximum size of the image

offset: start offset of the image in the target device

A binary image of this PIT file will be flashed into a fixed location in the device whenever the flash tool is invoked.

Image selection:

The image selection window allows the user to provide only the PIT file initially. The PIT file should contain the details of all image files to be flashed. Once the PIT file is provided, a list of edit boxes will appear in the image selection window, with their tag names as given in the pit file (given in Figure 2 below). Now user can select the input images for flashing.

NOTE: The tag names for certain images are fixed. It includes BL0, FFE, M4APP and FPGA. However, there is no restriction on the actual binary name. User can choose any name for the images.

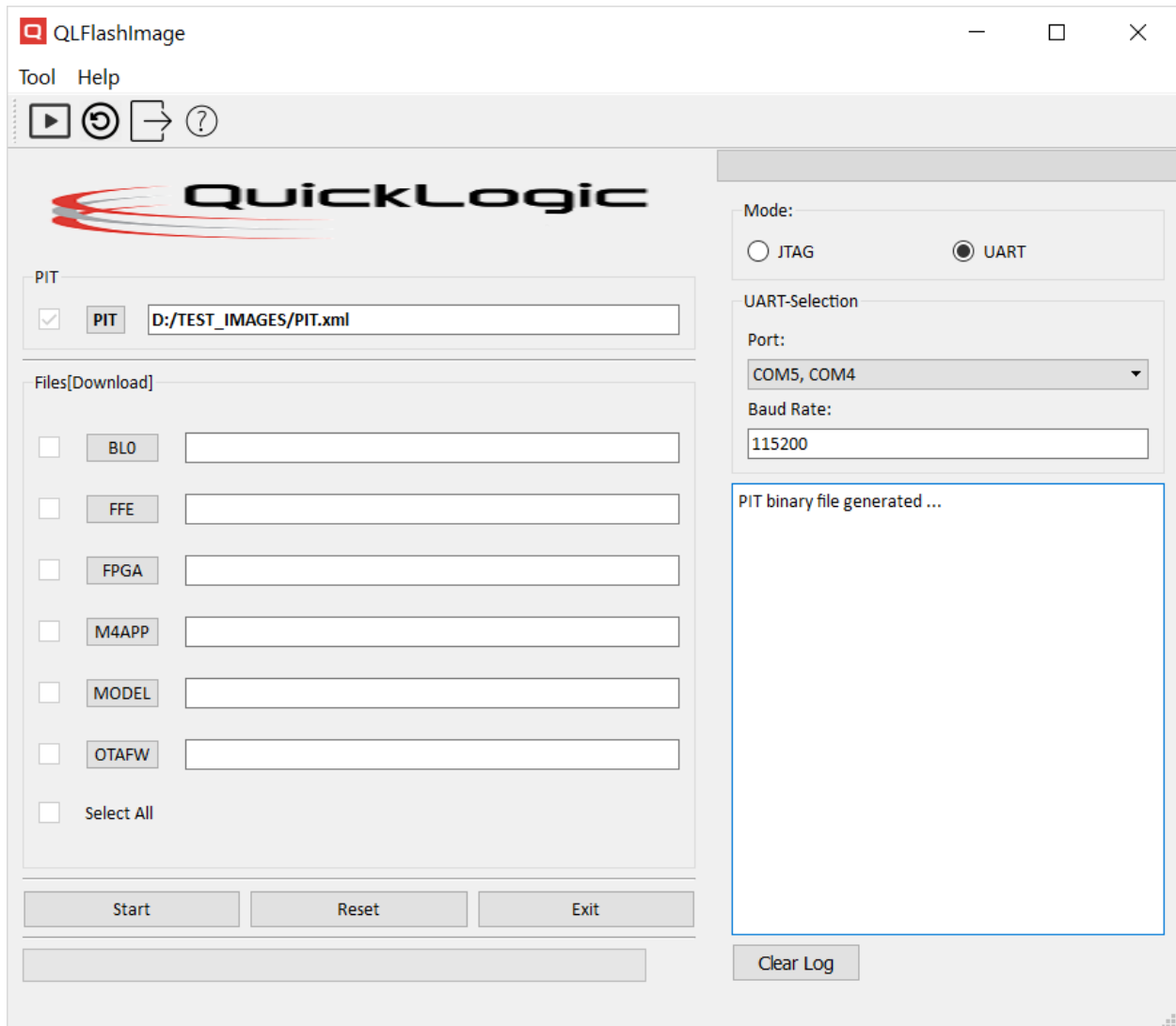


Figure 2: Input image edit box list based on the PIT file content.

The flash tool saves context of previous invocation of the tool. Once a PIT xml is selected, the context will be restored. It includes the flash tool type (JTAG/UART) and the input images selected (Figure 3)

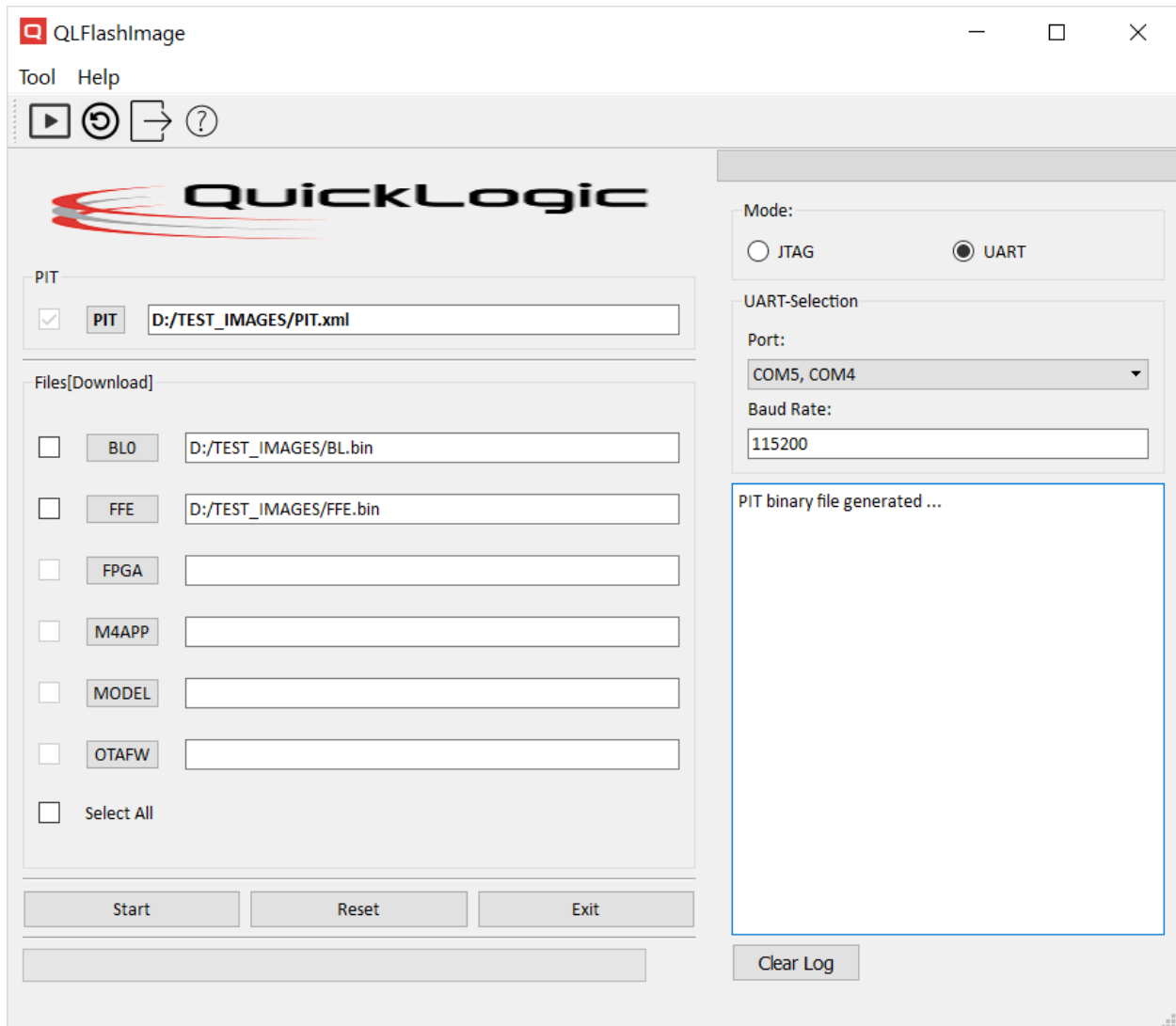


Figure 3: BL0 & FFE images are restored when the PIT xml is selected.

Click the check box 'Select All' to choose all listed files (in Figure 3, BL0 & FFE) for flashing. The button 'Clear Log' is provided to clear the message log sub-window.

Save and restore feature is enabled by default as given in Figure 3(a). It can be disabled by un-checking the option from the Tool menu as given in figure 3(b)

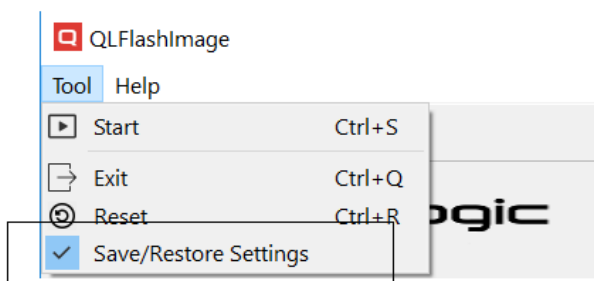


Figure 3(a): Enable Save/Restore

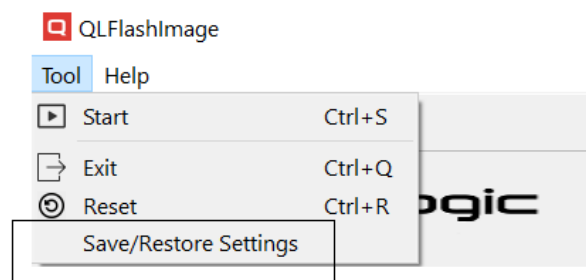


Figure 3(b): Disable Save/Restore

Device Flashing

Device flashing is supported with both JTAG and UART mode.

NOTE: In each case, the tool always ensures a flash verify once the image is successfully flashed. Any error during the flash or verify process will be reported to the end user.

1. JTAG Mode

Select the button 'JTAG' for this mode. Select required image files (see Figure 4) and then click the 'Start' button to begin device flash.

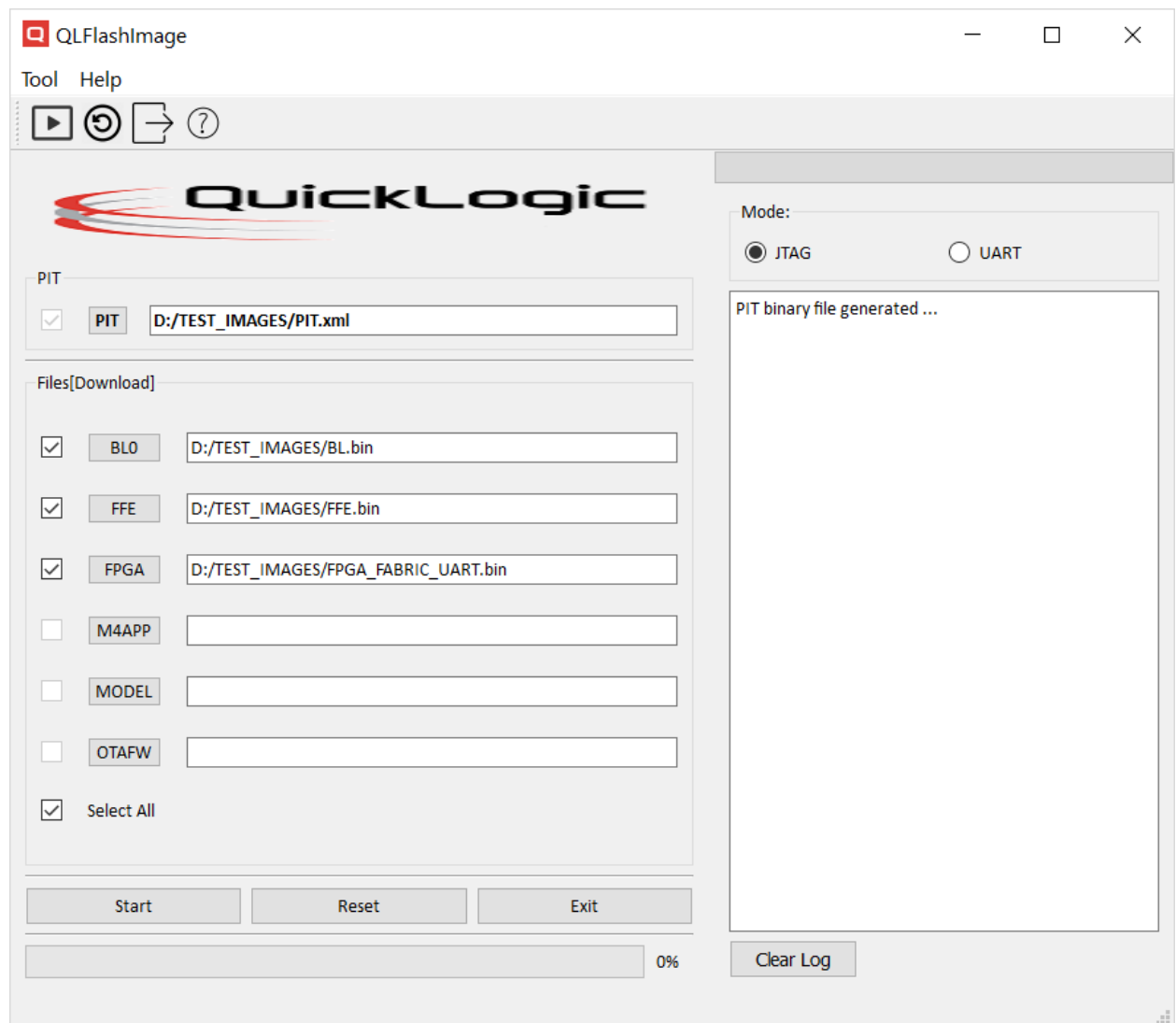


Figure 4: Device flashing using JTAG

CAUTION: Make sure the device is connected to the computer using JTAG before clicking the Start button. Take care, if any other hardware configuration (like boot-strap pin) is required for JTAG connection.

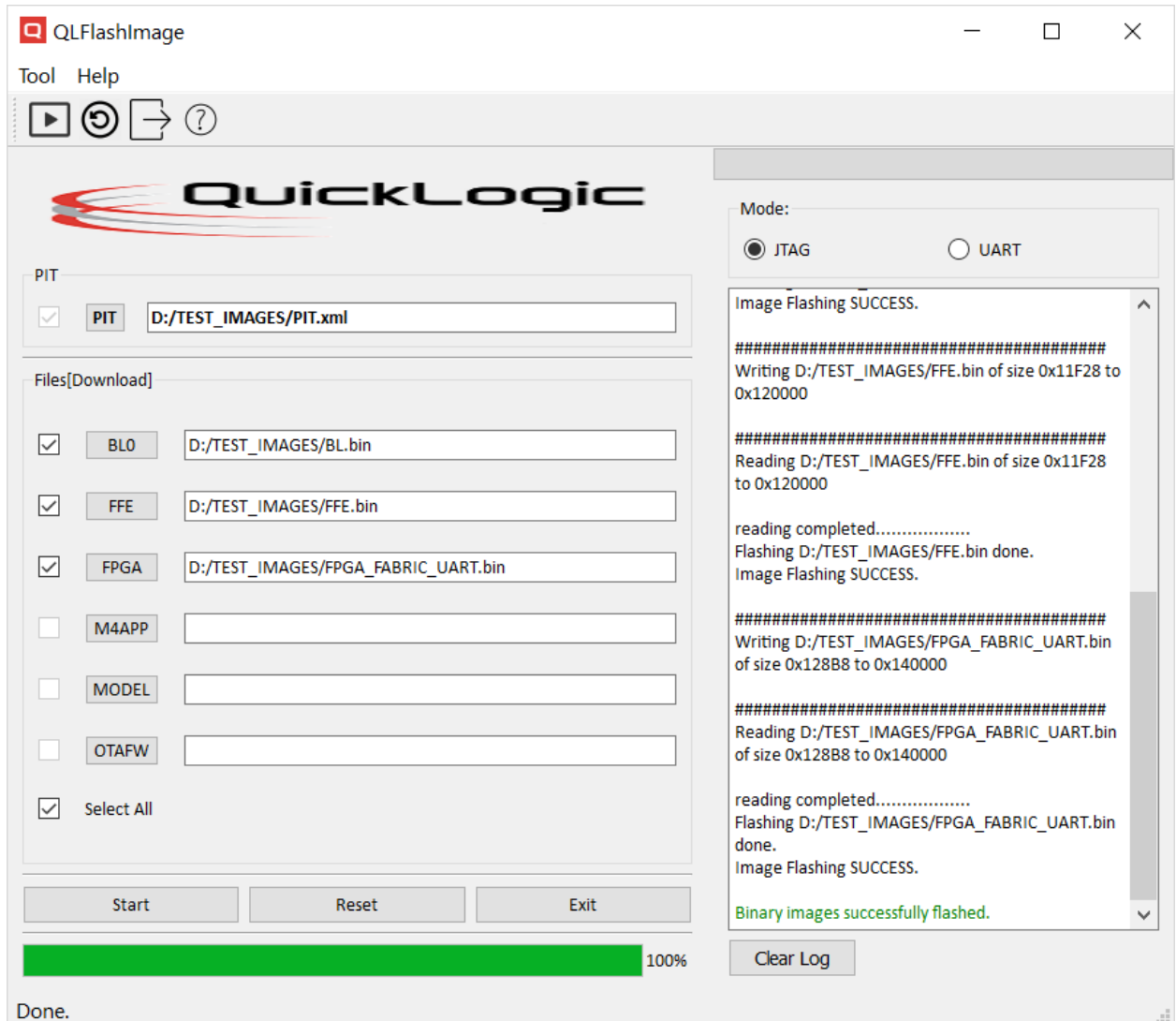


Figure 5: Successful device flashing using JTAG.

The status can be found from the log window and the progress bar. Any error detected during the device flash will be reported in the log sub-window. Figure 5 shows the typical message printed during a successful device flash.

2. UART Mode

Select the button UART and the required image files to flash the device (see Figure 6).

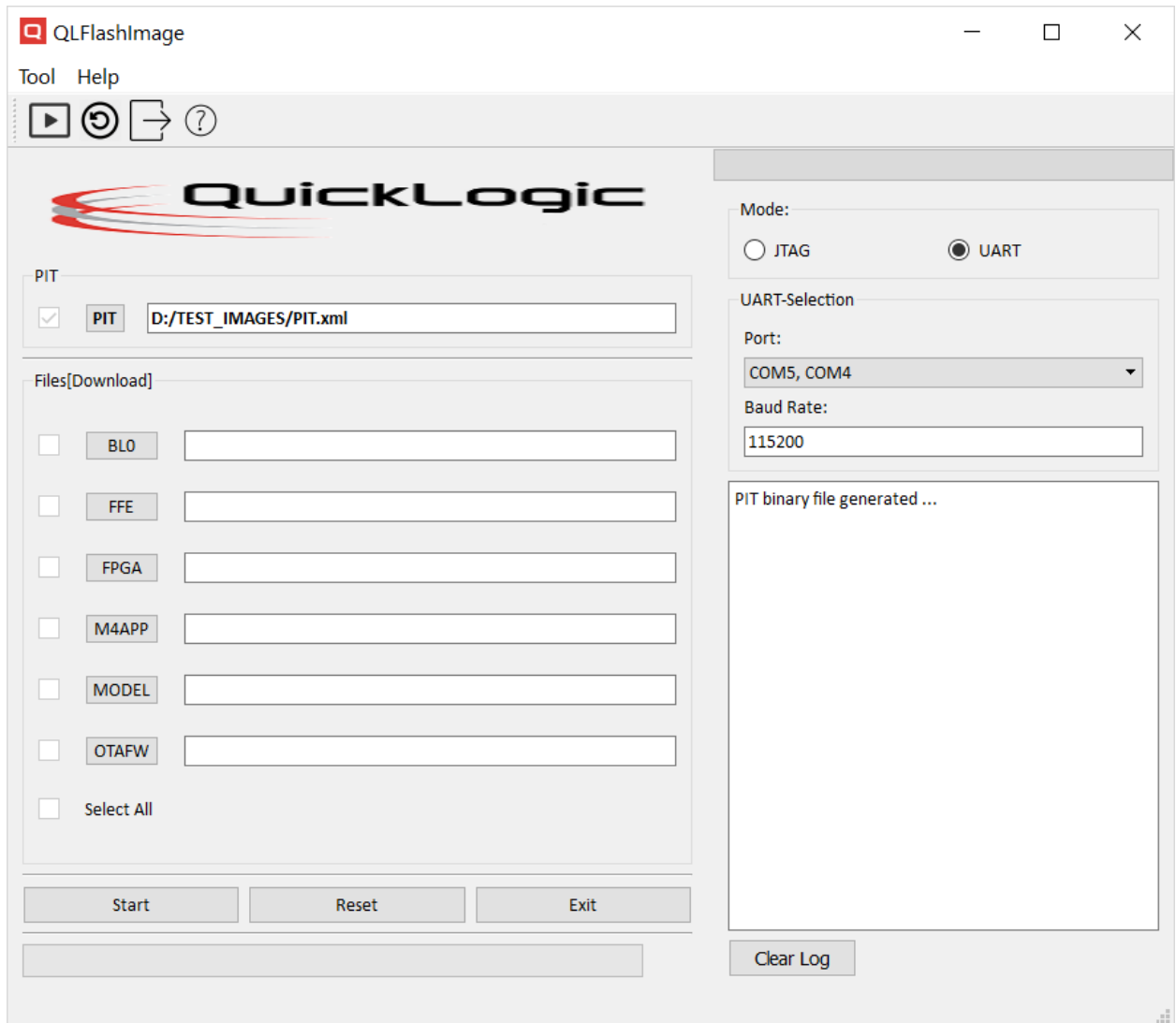


Figure 6: Device flashing using UART mode

Multiple devices can be flashed concurrently using the PC tool. Each device should get separate COM port. Initially when the tool is opened, all detected COM Ports will appear in the COM port's check box and all are selected by default, (given in Figure 7: a). If you want to exclude any port from the list, unselect it from the checklist (as given in Figure 7: b).

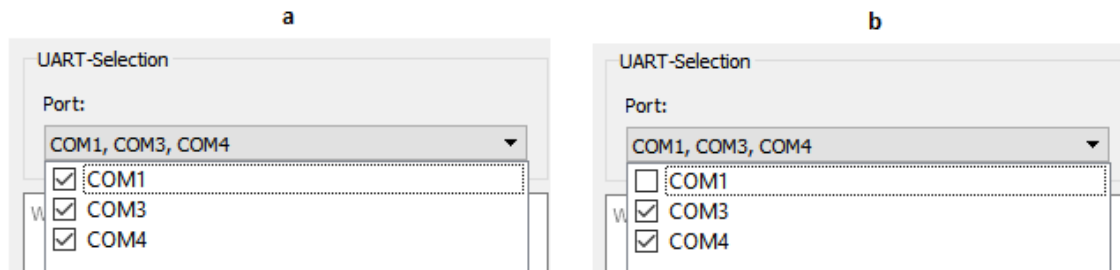


Figure 7: a. default checklist view b. COM1 is excluded

NOTE: The Boot Loader (BL) code should be available in the device to initiate the image flashing using UART mode. The existing BL code can be re-flashed further using UART mode.

Since the BL code is already available in the flash, there is no need to flash the BL code again (unless it is necessary). Figure 8 below shows the FPGA & M4APP flashing process using UART mode.

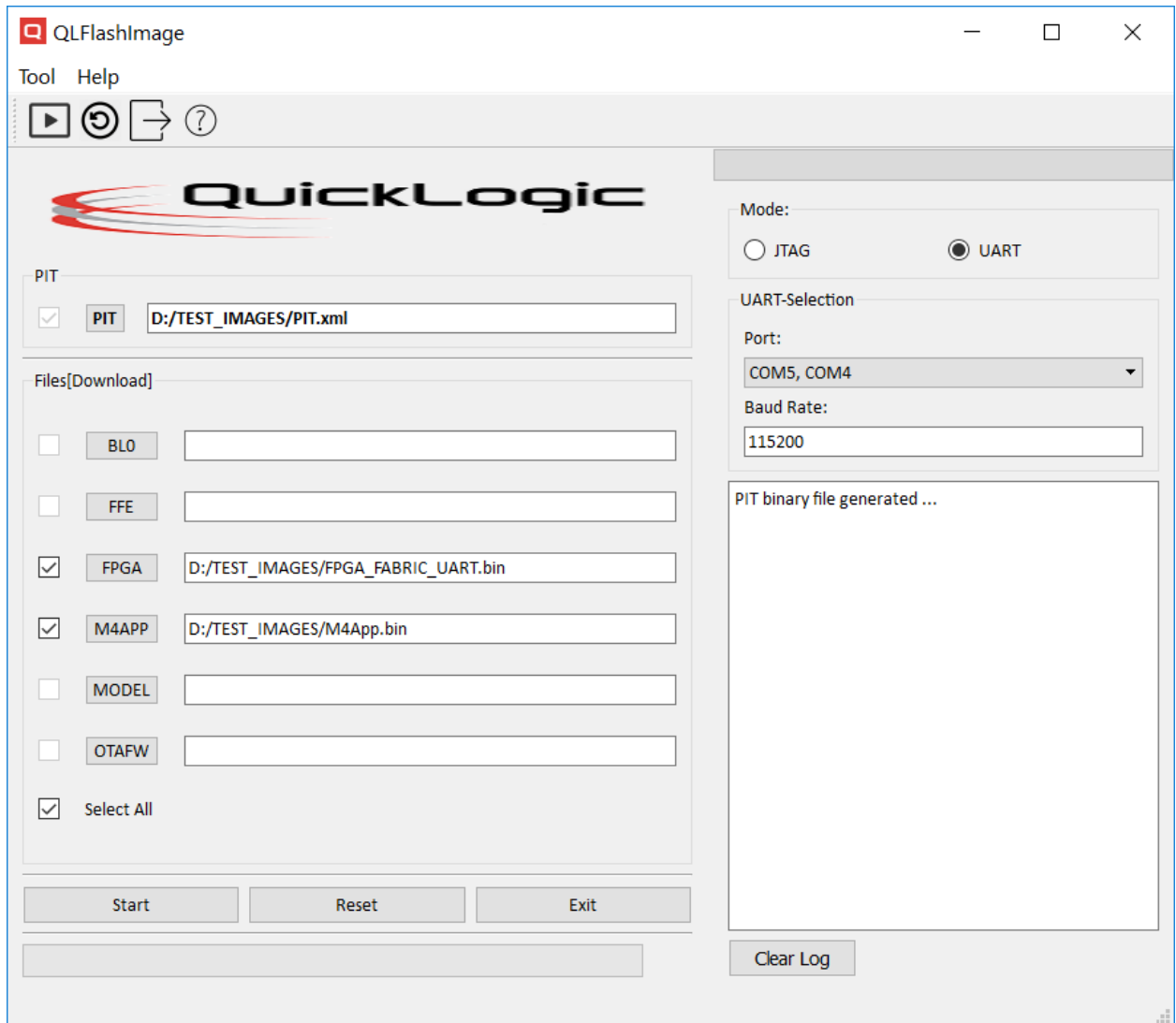


Figure 8: Select input files for UART Device Flash

NOTE: Once the COM ports are selected and/or unchecked from the checklist, the Port's check box displays only those ports which are selected for flashing.

UART serial transmission is configured using python scripts. Serial transmission requires various handshaking between the host and the target for establishing connection and to transfer images. With multi-device flash support, the log sub window shows only the final status of device flashing for the selected devices (see Figure 9). Image flash may fail on various scenarios and user friendly diagnostic messages will be displayed in the log window for each device.

NOTE: A detailed log during the device flash process is stored in the 'logs' directory. The handshaking between the device and the PC tool is captured in the detailed log. The log name is *dbg<COM>.log* for a device, where <COM> is the com port number. Example, for COM4 the log should be *dbgCom4.log*

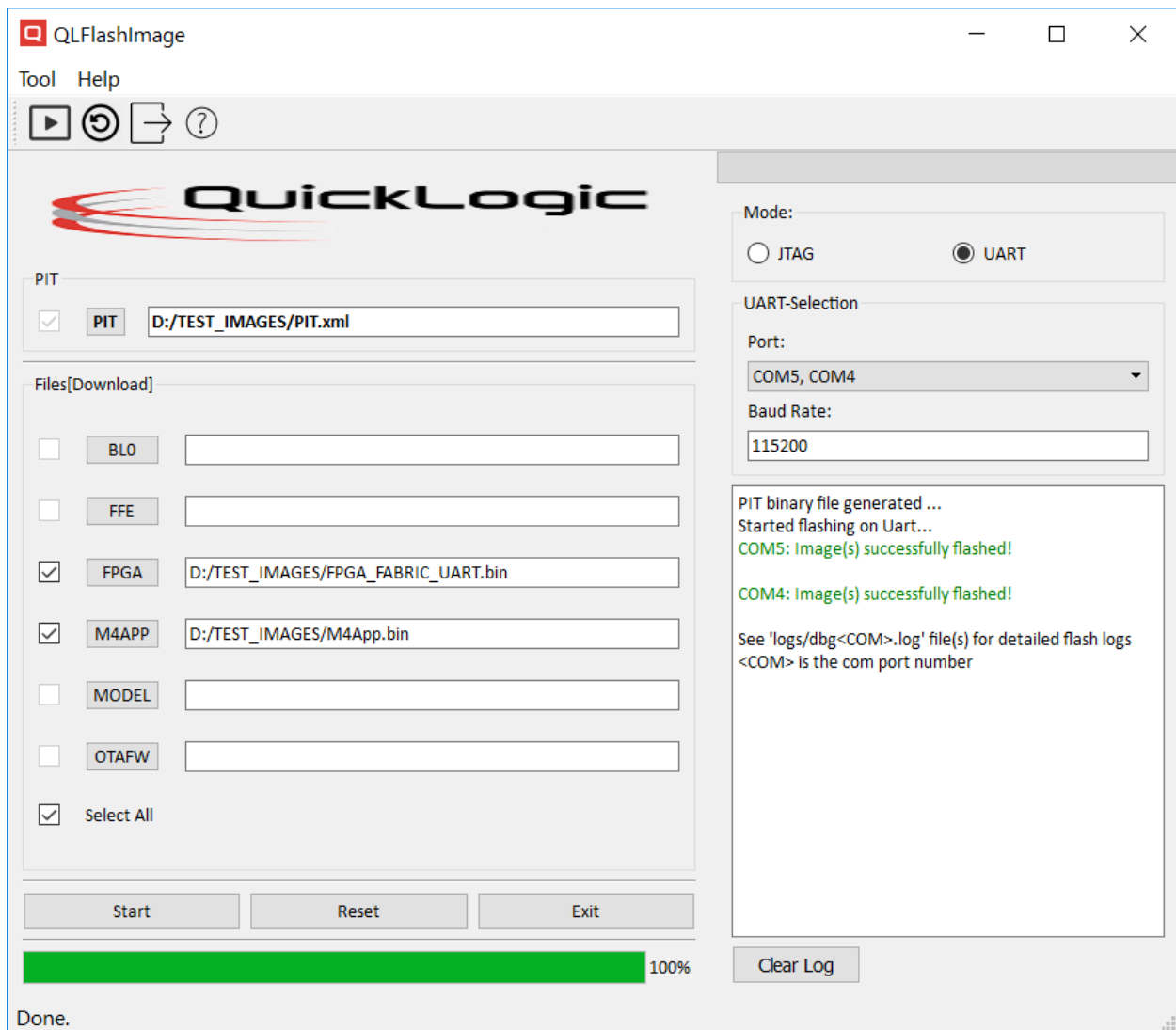


Figure 9: Successful UART device flashing

CAUTION: The Boot Loader (BL) code should be available (loaded) in the device to initiate the image flashing using UART mode. The existing BL code can be re-flashed further using the UART mode. If M4APP is running in the device, for establishing the connection make sure the APP contains the code to accept the handshake from the flash tool.

Command line Tool

With v1.0 release, a command-line version of flash tool is supported. The same executable when run in the **command-prompt** with appropriate arguments will serve the purpose. All features supported in the GUI mode will also be available in the command-line version.

NOTE: When the tool is invoked with no arguments, the GUI mode will be brought up automatically.

```
-?, -h, --help      Displays this help.
-v, --version       Displays version information.
--jlink             Flash images using JLink.
--uart              Flash images using UART.
--port <comList>    COM port list ("COM1,COM2,COM3").
--baud <baudRate>   Baudrate of M4APP.
--files <fileList>  input files to flash. Format:
                   --files="TAG1=file1,TAG2=file2,TAG3=file3".
```

Figure 10: command-line options.

Figure 10 shows the available command-line options. Since UART mode supports multiple device flashing, the comma-separated comport list should be given in double quotes. The same is true for the file list. The file name should be bound to the tag name as given in the examples below. As mentioned earlier, the PIT file is mandatory for flashing.

JLink Flash:

```
QLFlashImage.exe --jlink
--files="PIT=D:/TEST_IMAGES/PIT.xml,BL0=D:/TEST_IMAGES/BL.bin,FFE=D:/TEST_IMAGES/FFE.bin"
```

UART Flash:

```
QLFlashImage.exe --uart --port="COM4" --baud=115200 --
files="PIT=D:/TEST_IMAGES/PIT.xml,BL0=D:/TEST_IMAGES/BL.bin,FFE=D:/TEST_IMAGES/FFE.bin"
```

NOTE: The help option is provided to see all possible options. To know the tool's version, one can invoke -v or --version option. User should press 'Enter' to get the prompt back when -h or -v option is used.

Error Messages

The tool captures all possible errors during the image flash. If the tool fails to respond, the application should be restarted.

Following are the meaningful diagnostic messages which may occur at various error cases.

PIT entry Issues:

Error: The image size for 'D:/QFlashImage_Release_v1.0_RC1/TEST_IMAGES/Images/QL_M4.bin' has crossed the maximum allowed size.

Figure 11

This error may occur if any parameter in the PIT file is wrong. Here for example, the actual size of the M4 image is more than the value specified in the PIT file.

JTAG Issues:

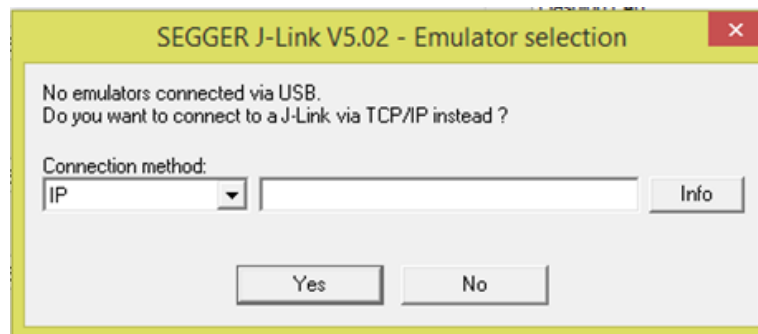


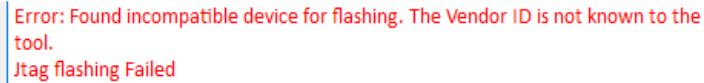
Figure 12

This window will be popped up if JTAG is not connected to the host machine. Once the JTAG is connected, the software tool is ready for flashing. We recommend restarting the application and start flashing the target once again.

JLink Not Installed, please install the JLink driver before using it.
Jtag flashing Failed

Figure 13

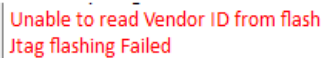
If JTAG driver is not installed or if there is a mismatch of the REGISTER ENTRY install path which may arise due to multiple JTAG driver installation/uninstallation flash tool doesn't work as expected. This is one such error to indicate the user about missing JTAG driver installation.



```
Error: Found incompatible device for flashing. The Vendor ID is not known to the tool.
Jtag flashing Failed
```

Figure 14

There is a validation on the connected device before the flash process using JTAG mode. This is done by checking the Vendor ID of the device with a known list of devices in the flash tool. A device ID xml is maintained in the tool for this purpose. If the device ID is missing in the list the tool reports this error. Flashing won't be proceeded in such cases.



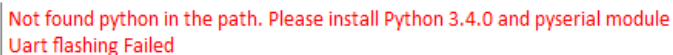
```
Unable to read Vendor ID from flash
Jtag flashing Failed
```

Figure 15

Sometimes the tool fails to read the Vendor ID from device. It occurs due to misplaced JTAG connection or the boot-strap pin mismatch. This error indicates that disruption in the JTAG path.

UART mode Issues:

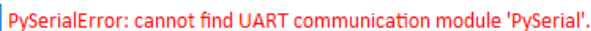
In the UART mode only the final status is displayed in the message log window of the tool. A detailed log will be available in the logs directory.



```
Not found python in the path. Please install Python 3.4.0 and pyserial module
Uart flashing Failed
```

Figure 16

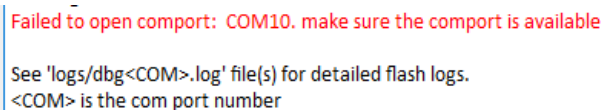
Python installation is required for UART flashing. This error occurs when there is no python installed in the PC.



```
PySerialError: cannot find UART communication module 'PySerial'.
```

Figure 17

This error occurs when serial communication module **pyserial** is not installed. It is a python library which must be installed separately using the command 'python -m pip install pyserial'



```
Failed to open comport: COM10. make sure the comport is available

See 'logs/dbg<COM>.log' file(s) for detailed flash logs.
<COM> is the com port number
```

Figure 18

This may occur when the specified comport is already connected to another device or terminal. Make sure to free all such connections before start flashing in the UART mode.



Figure 19

This may occur due to many reasons:

- 1) Device flashing failed due to interruption in the UART path.
- 2) There is no device connected to the selected COM port (COM10 here)
- 3) The UART cable driver is not installed properly.
- 4) The BL/M4APP running in the device failed to recognize the handshake sent by the tool.

The detailed log will help to identify the reason for the failure in this case.

Quick Buttons

The following shortcut buttons are provided on the user interface to select the operations.



Start



Reset



Exit



About the flash image

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