# AN13206

## Modifying Debug Firmware on i.MX RT10xx Boards Featuring An LPC4322-based Debug Probe

Rev. 0 — 04/2021 Application Note

Contents



## 1 Introduction

Several NXP evaluation boards in the i.MX RT10xx series have a debug circuit based on the LPC4322 MCU. Besides the default firmware, this circuit can use an NXP-proprietary CMSIS-DAP based image that also supports SWO features and this firmware is referred to as LPC-Link2. This image also provides higher performance flash programming but does not include drag-drop programming capability. The LPC4322 debug circuit also has an option for an evaluation version of SEGGER's popular J-Link probe. i.MX RT10xx EVKs are factory programmed with an OpenSDA based CMSIS-DAP implementation with drag-drop programming capability, but it is possible to run any of the three firmware options on these i.MX RT10xx boards.

Table 1 describes the differences among the three firmware options.

**Table 1. Comparison of firmware options**

| | OpenSDA Daplink | LPC-Link2 CMSIS-DAP | LPC-Link2 Segger J-link |
|---|---|---|---|
| Power via USB (automatic target regulator control) | √ | X | X |
| SWD debug with MCUXpresso IDE | √ | √ | √ |
| SWO trace/profiling/ITM | X | √ | X |
| Drag/drop programming | √ | X | X |
| UART-USB (VCOM) | √ | √ | √ |
| Flash programming speed (relative to OpenSDA) | 1X | 3-4X | 4X |

Only the OpenSDA firmware version controls the regulator which power the target processor. When using the firmware other than the default one, the power must be provided by other power sources. Such as a barrel-type power connector or USB1 connector. For the power information, the hardware users guide can be a reference. The supply is at least 500 mA so that brownouts do not occur in high current applications (such as graphics with backlit displays).

This application note describes how to the program the on-board debug probe board firmware with LINK2-CMSIS or J-Link firmware and how to switch back to the OpenSDA firmware (factory default.)

The hardware used in this application note is MIMXRT1060-EVK (Rev.A1) but the same techniques can be used with any i.MX RT10xx EVK with an LPC4322 debug probe. The utility used to update the firmware of LPC43xx/18xx devices is called LPCScrypt, and this utility can be found at LPCScrypt v2.1.2.

**NOTE**

When programming the J-link firmware with LPCScrypt, use an updated firmware image from SEGGER, as updates to their firmware are required from time to time.

# 2 Programming LINK2 CMSIS

1. Download and install LPCScrypt.
2. Install the LPC4322 DFU jumper, **J42** on MIMXRT1060-EVK, to force DFU boot mode.

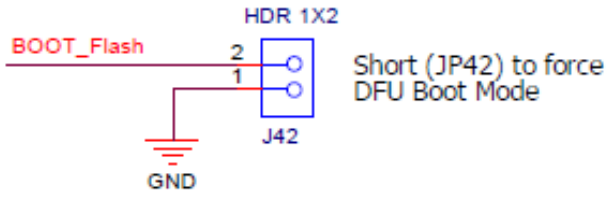


**Figure 1. DFU jumper**

3. Power on the board through the on-board debug probe USB connector, **J41** on MIMXRT1060-EVK.

**NOTE**

Connect 3-4 of J1 to power the board from USB port and then connect LINK2 to LPC4322 debug port, **J34**.

4. Go to the scripts subdirectory and run the `program_CMSIS.cmd` to run the script to program the debug probe for CMSIS. The default path for `.cmd` files is:

```
C:\nxp\LPCScrypt_2.1.2_57\scripts
```

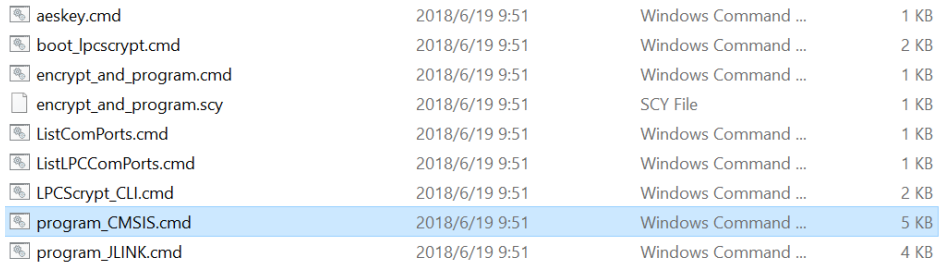


**Figure 2. Select program_cmsis**

5. Follow the on-screen instructions. Press any key to load the program and the script output shows that the firmware is updated successfully.

```
LPCScrypt - CMSIS-DAP firmware programming script v2.0.0 June 2018.

Connect an LPC-Link2 or LPCXpresso V2/V3 Board via USB then press Space.

Press any key to continue . . .

Booting LPCScrypt target with "LPCScrypt_218.bin.hdr"
LPCScrypt target booted
.
Programming LPCXpresso V2/V3 with "LPC432x_IAP_CMSIS_DAP_V5_183.bin"

- LPCXpresso V2/V3 programmed successfully and has the unique ID: FRAZCQER
- To use: remove DFU link and reboot.

Connect Next Board then press Space (or CTRL-C to Quit)
```

**Figure 3. CMSIS firmware image programming output**

6. As shown in Figure 3, there is a log showing the firmware has been programed successfully. Then, remove the jumper of J42 to exit the DFU mode and re-power the board.

# 3 Programming LPC-Link2 Segger J-Link

The procedure of updating the mode into J-link is the same as LPC-Link2 CMSIS-DAP, except for running the `Program_JLINK.cmd`.

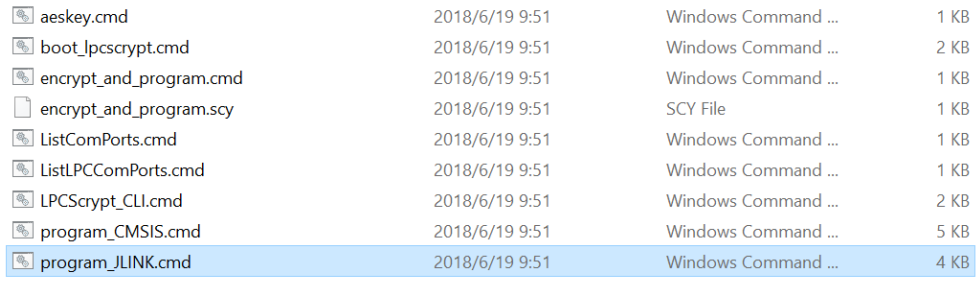


**Figure 4. Select program_JLINK**

Figure 5 shows the output of a successful programming session.

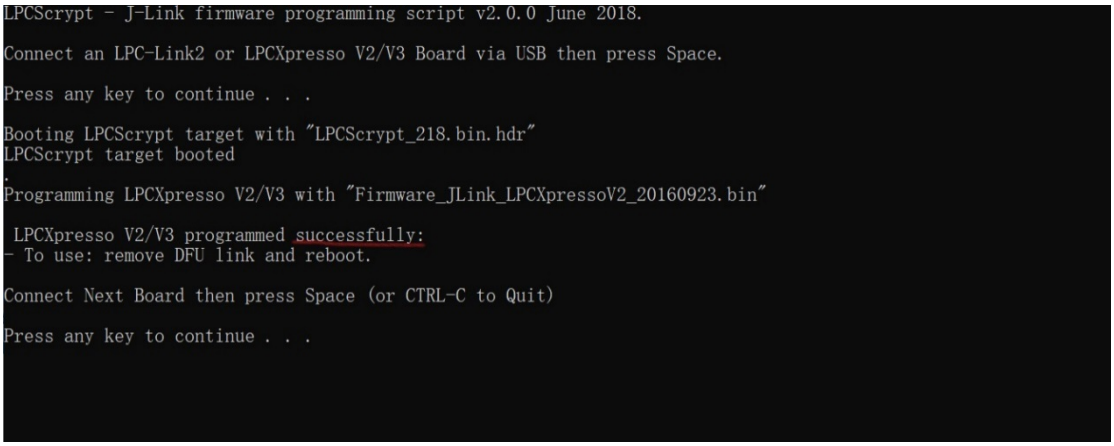


Figure 5. J-Link programming script output

# 4 Switching back to OpenSDA DapLink firmware (factory default firmware)

After updating to LINK2 CMSIS or J-Link mode, to switch back to default firmware, follow steps as below.

1. Install a bootloader needs to be installed using `LPCScrypt` before loading the actual OpenSDA image.
2. Use drag-drop programming.

## 4.1 Getting the firmware images

1. Download the bootloader and default firmware application from OpenSDA Serial and Debug Adapter.
2. Select the board from the pull-down menu, as shown in Figure 6.

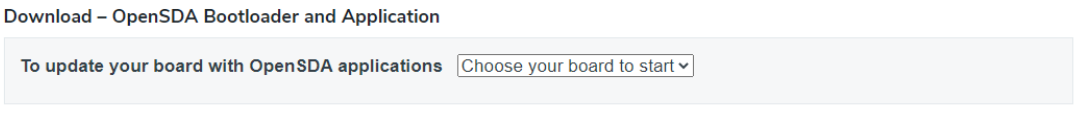


Figure 6. Drop-down menu

3. After selecting the board, the screen changes to show available images for that board.

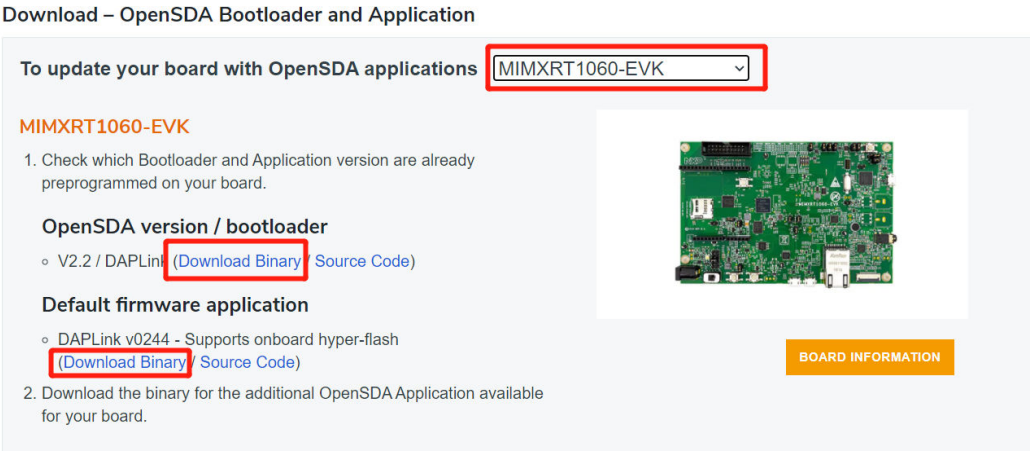


Figure 7. Available images

4. Place the bootloader binary in a temporary directory without spaces in the path, e.g. `c:\Temp\bootloader`.
5. Enter the DFU mode with connector **J42** and then power on the board.
6. Open a command window and go to the LPCScrypt installation directory. Go to the `bin` subdirectory and run the script `boot_lpcscrypt.cmd`. Figure 8 shows the result.

```
C:\NXP\LPCScrypt_2.1.2_57\bin>..\scripts\boot_lpcscrypt.cmd
Booting LPCScrypt target with "LPCScrypt_240.bin.hdr"
LPCScrypt target booted
```

Figure 8. Result

7. Enter the command:

```
lpcscrypt erase all
```

Errors may be reported but can be ignored.

8. Enter the command to program the bootloader into BankA (address 0x1a000000):

```
lpcscrypt program c:\Temp\bootloader\lpc4322_bl_crc_20180810.bin 0x1a000000
```

9. After a few seconds, the result in a message is as shown in Figure 9.

```
..
Programmed 57344 bytes to 0x1a000000 in 0.141s (395.807KB/sec)
```

Figure 9. Result in message

10. Now remove **J42**, and power cycle the board. The board will now enumerate as a mass storage device called **MAINTENANCE**.
11. To install the OpenSDA firmware, drag and drop the binary file onto the MAINTENANCE drive mentioned above. The board (mass storage device) drive name will change to a board-specific name, e.g. RT1060-EVK.

Now the debug probe is ready to be used.

# 5 Revision history

| Rev. | Date | Substantive changes |
|---|---|---|
| 0 | 04/2021 | Initial release |

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