

Industrial Battery Monitoring IC Reference Firmware Update Tool User Manual

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1. Overview

1.1 Overview

The Industrial Battery Monitoring IC Reference Firmware Update Tool provides an easy and reliable way to update the MCU firmware of Nuvoton industrial BMS evaluation board.

This manual explains how to utilize the Industrial BMS Ref FW Update Tool to version up the MCU firmware of Nuvoton M483SGCAE MCU Board.

1.2 Operation of Firmware Update Tool

The firmware update operation involves using a PC Application (GUI) to transfer an authorized MCU firmware update file to the MCU (M483SGCAE) of the MCU Board via a USB-UART interface. This operation is depicted in Figure 1.

Do note that the firmware update operation is separate and independent from the operation of the Industrial BMS Reference Solution Kit. Hence, it's important to ensure that the DIP Switch setting of MCU board are changed appropriately for the firmware update operation.

The DIP Switch setting for the firmware update operation will be explained in the upcoming chapter 2.

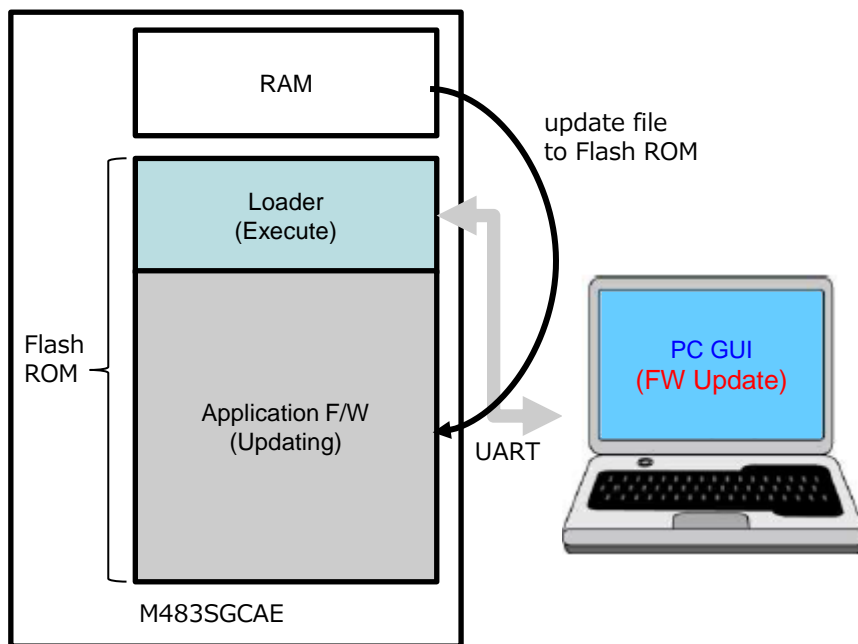


Figure 1. FW update operation

2. Configuration

2.1 Settings and Connections

The Industrial BMS Ref FW Update Tool mainly consists of 4 components:

- 1) MCU Board – M483SGCAE MCU Board
- 2) PC GUI executable file – Industrial BMS Ref FW Update 1.00.exe
- 3) Authorized MCU update file – .bin file
- 4) USB to UART conversion cable – TTL-232R-3V3

To update the firmware, set the setting of DIP Switch of M483SGCAE MCU Board to the "0110" position (default setting is "1111"). The LED indicator will show normal status (refer to chapter 2.5) when power up. With a USB-UART conversion cable (TTL-232-3V3) connected to the PC, the user can then evoke the PC GUI tools (Industrial BMS Ref FW Update 1.00.exe) to proceed with the firmware update process.

The settings and connections is depicted in Figure 2.

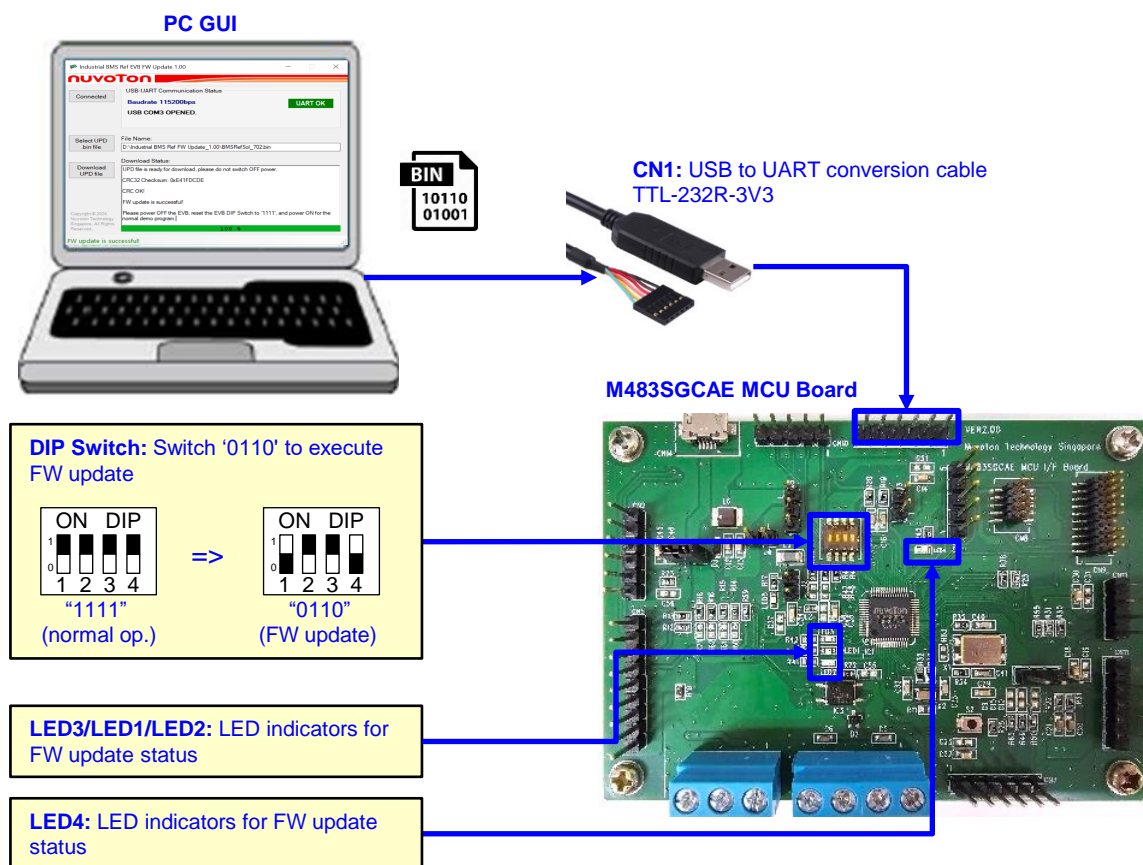


Figure 2.1 FW update settings and connections

2.2 Power Up

The MCU board can be powered either by the AFE board or an external power supply.

By AFE board:

Power the VBAT-IN of the AFE board, then toggle the VPC switch as follows: move the VPC switch to the left position, then return it to its original middle position. This action will wake up both the BMIC and MCU board. The LED indicator of MCU board will display the system status.

12.5V to 85V [KA49701A (ES)]

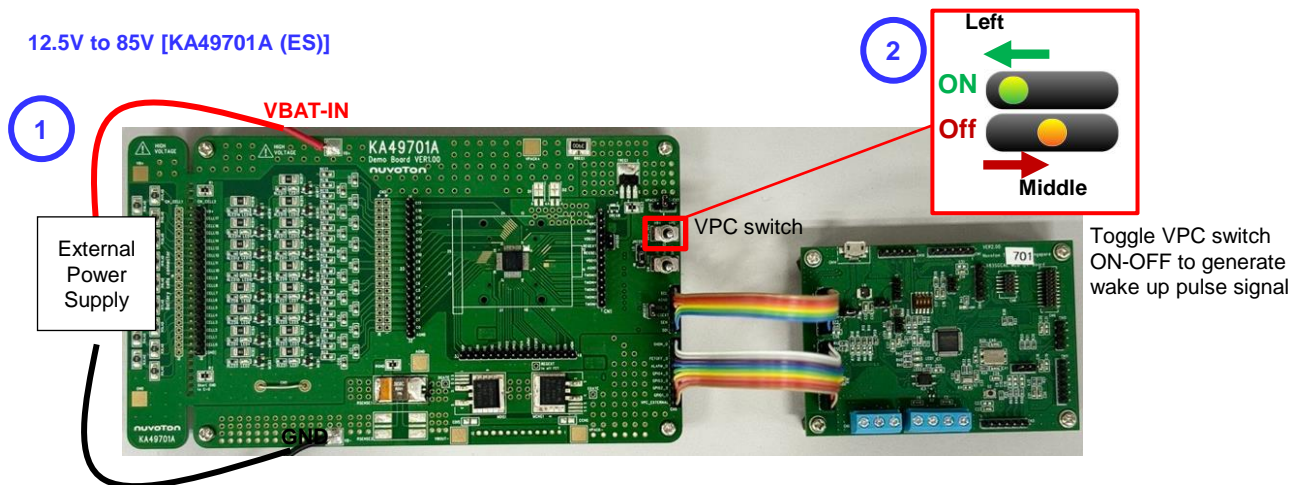


Figure 2.2 Instruction of VBAT-IN supply and VPC switch when power up MCU Board by AFE board

By external power supply:

Based on the jumper configuration below, power the MCU board by connecting an external 5V power supply via the Micro USB connector.

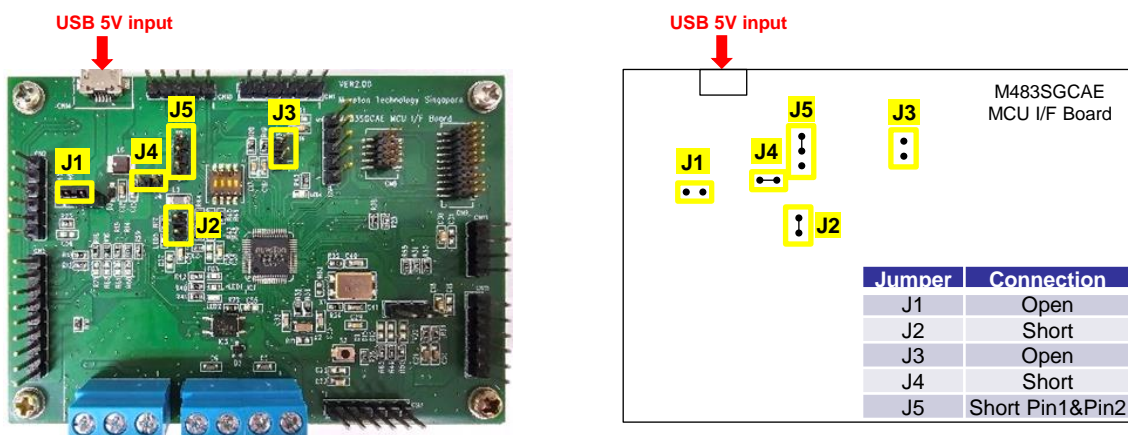


Figure 2.3 Jumper Configuration when power up MCU board by external power supply

Note: Please be aware that the BMIC's WDT is disabled by MCU.

2.3 USB Driver Installation

In order to use the USB-UART conversion cable (TTL-232R-3V3), a USB driver must be installed. If the "FTD2XX_NET.dll" file is not present in the same folder as the application file (Industrial BMS Ref FW Update 1.00.exe), the PC GUI will not be able to perform the firmware update. In such case, user must restore the "FTD2XX_NET.dll" file and restart the PC GUI to proceed with the update.

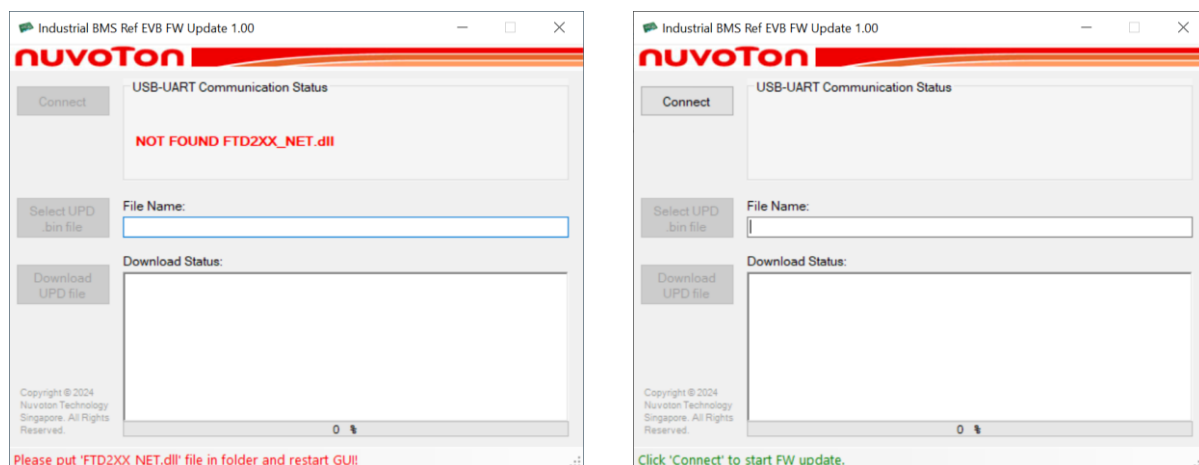


Figure 2.4 PC GUI without/with FTD2XX_NET.dll file

2.4 UART Baudrate

The Industrial Battery Monitoring IC Reference Firmware Update Tool offers UART Baudrate speeds for transmitting data between the PC GUI and the MCU is 115200bps. The estimated firmware update time is about to 30 seconds.

2.5 LED Indicators for FW Update Status

The Industrial BMS Ref FW Boot Loader provides LED indicators to monitor the FW update progress and alert for any malfunctions during FW updating operation.

The table below shows the definition of LED states of D1/D2/D3/D4 on the M483SGCAE MCU Board.

● : Light OFF ○ : Light ON ⊙ : Blinking (2Hz) ⚙ : Fast Blinking (4Hz)

LED state (D4 D3 D1 D2)	Item	Content
●●●●	Normal state (Wait for FW Update, or FW Update progress < 25%)	Include FW Update progress 0% (Wait for FW Update when SW4 all bits are 0110)
●●●○	Normal state (FW Update progress 25~50%)	-
●●○○	Normal state (FW Update progress 50~75%)	-
●○○○	Normal state (FW Update progress > 75%)	-
○○○○	Normal state (FW Update completed 100%)	FW update 100% & CRC match, wait for reset.
⚙⚙⚙⚙	Error occurred	Include flash erase/write error & CRC mismatch error
●●○○	Normal state (Wait for FW Update)	Due to CRC mismatch

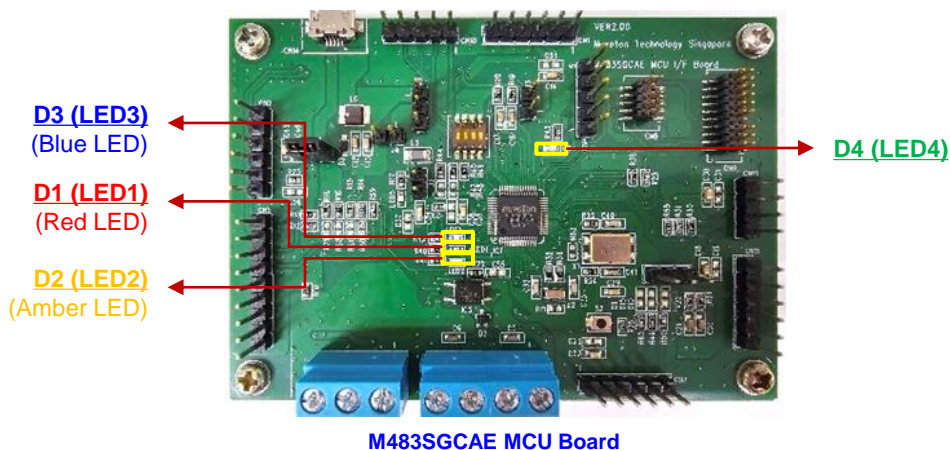


Figure 2.5 FW update LED indicators

3. Operation of PC GUI

3.1 PC GUI Layout

The PC GUI Application is designed to be user-friendly and informative, featuring a streamlined layout with intuitive controls and clear status alerts. Additionally, the system is capable of managing malfunctions and errors effectively. Updating the firmware to a newer version requires minimal steps for the user. Below is an explanation of the Industrial Battery Monitoring IC Reference Firmware Update Tool's GUI layout and its various functions.

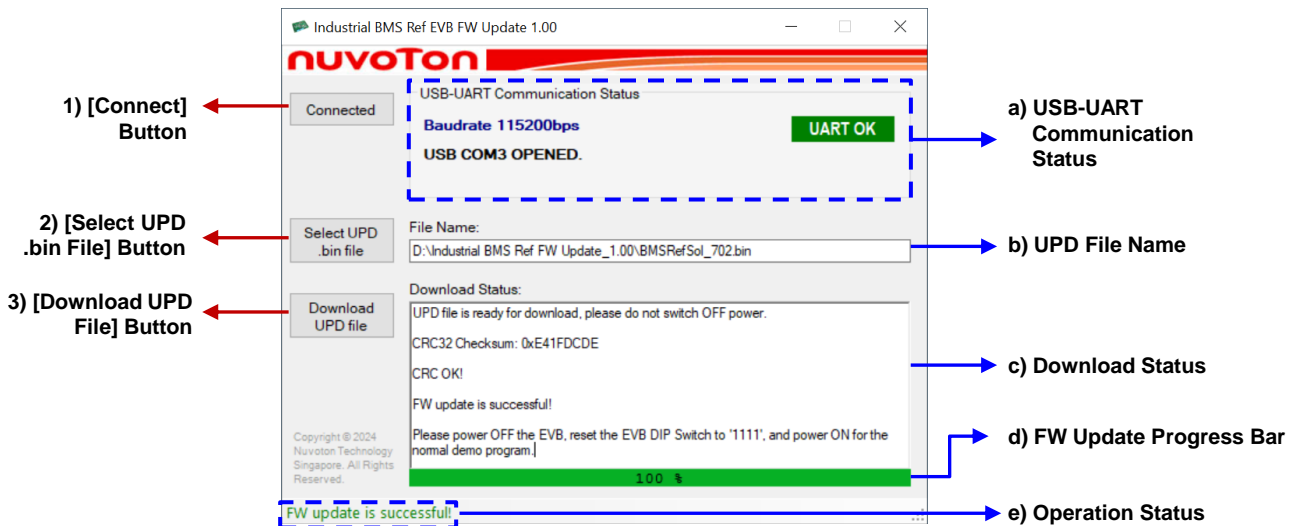


Figure 3.1 PC GUI layout

Operations:

- 1) **[Connect] Button** – To connect / disconnect the MCU Board from PC via USB to UART conversion cable. If the connection is successful, the button text displays “Connected”. If fail, it displays “Connect”.
- 2) **[Select UPD .bin File] Button** – To select target FW update file (.bin)
- 3) **[Download UPD File] Button** – To download FW update file means to transfer the target FW update file (.bin) to MCU via USB-UART conversion cable.

Status:

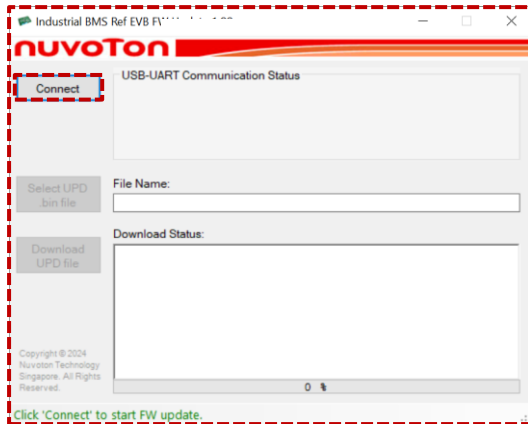
- a) **USB-UART Communication Status** – To display the status of USB-UART connection. The status includes :
 - UART Baudrate
 - Status of USB com port connection
 - USB reset button with message (refer to chapter 4.1)
- b) **UPD File Name** – To display the target FW update file link and name.
- c) **Download Status** – To display the status and result of FW update.
- d) **FW Update Progress Bar** – To display the FW update progress in percentage.
- e) **Operation Status** – To display the instruction and status of PC GUI operation.

3.2 PC GUI Operation

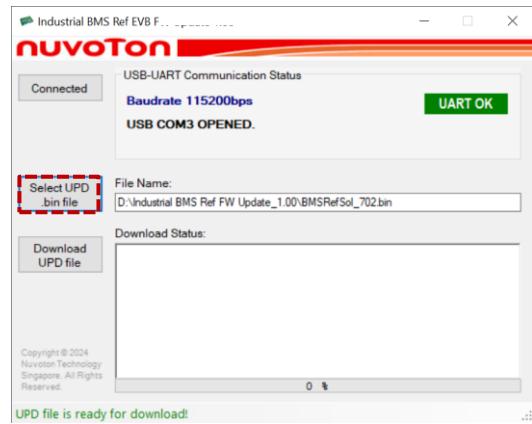
To operate the Industrial Battery Monitoring IC Reference Firmware Update Tool for firmware update requires only 4 simple steps.

Step 1) Do setting of DIP SW on MCU board refer to Figure 2, and then power up MCU board. Connect the MCU board to the PC using a USB-UART conversion cable.

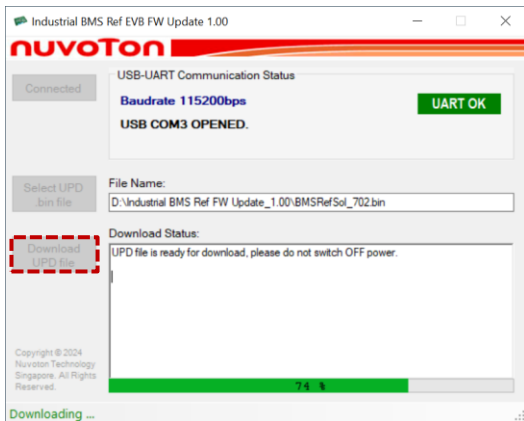
Step 2) Open the PC GUI and click “Connect” button



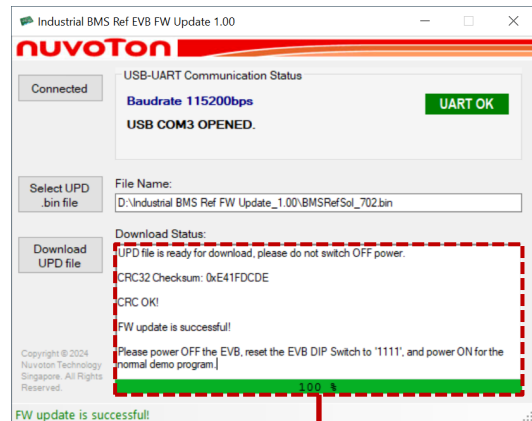
Step 3) Once “Connected”, click “Select UPD” button to select the target file



Step 4) Click “Download UPD file” button to start FW update



After step 4), FW updating started, GUI displays status, result, and update progress:



To return to BMS Ref Sol demo operation:

- Power OFF MCU board and remember to change back the original DIP SW settings to “1111” position.

FW Update progress is indicated in progress bar, and the result will be shown in the “Download Status” textbox.

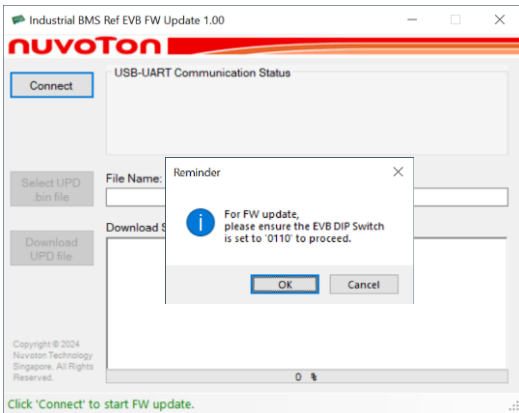
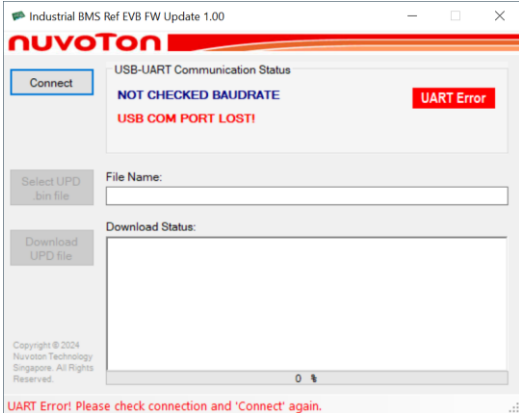
Once it reaches 100% and CRC is OK, the firmware update is considered as successful.

Figure 3.2 PC GUI Operation

4. Troubleshooting

4.1 Possible Issues and Solutions

The PC GUI is designed to effectively manage malfunctions and errors. In case the user encounters any errors during the FW update process, the table below outlines the possible causes and solutions that may help the user resolve the issue and successfully complete the update operation.

Item	Error	Solutions
1	<p>If an error occurs after verifying the following 3 conditions, it is possible that there is no bootloader present in the MCU software:</p> <ul style="list-style-type: none"> - DIP SW is set to "0110", then reset the MCU board (power OFF 5s then power ON); - However, the LED status is not in *Normal state (Wait for FW Update) due to CRC mismatch; - However, the LED status is not in *Normal state (Wait for FW Update, or FW Update progress < 25%).  <p>*Note : refer to chapter 2.4 for LED Indicators of FW Update Status</p>	<p>Possible Issue 1: Industrial Battery Monitoring IC Reference Firmware without boot loader</p> <p>Solutions: In case the user encounters difficulty on updating the board, they have 2 options:</p> <ul style="list-style-type: none"> - Use NuMicro ICP Programming Tool to flash the MCU; - Send the board to NTSG for FW update. <p>Additionally, when attempting to connect the MCU board by clicking "Connect" button on PC GUI, a reminder dialog box will appear, prompting the user to switch DIP SW to "0110" position before proceeding with the FW update.</p>
2	<p>The error message displays: "UART Error! Please check connection and 'connect' again."</p> 	<p>Possible Issue 1: The hardware connection problem</p> <p>Solutions: Ensure that the following connections are properly established: USB-UART conversion cable Power supply If there are more than one FTDI device*1 connected to PC, please remove other FTDI device*1</p> <p>*1: FTDI device is referring to the USB-UART conversion cable used in this tool.</p> <p>Possible Issue 2: If there is another GUI opening, e.g. "KA497xxRefSol_GUI"</p> <p>Solutions: Ensure there is only FW update GUI opening when updating FW.</p>

4.1 Possible Issues and Solutions

Item	Error	Solutions
3	<p>The FW update suddenly stop, and the progress bar is not updating, with the error message displays: "FW update fail! Please reset and update again."</p>	<p>Possible Issue 1: Power supply on MCU board is not stable, or MCU board connection becomes loose</p> <p>Solutions: User needs to power up MCU board and</p> <ul style="list-style-type: none"> - Click "Download UPD file" button to do FW update again. - Or close and restart the PC GUI to do FW update again.
		<p>Possible Issue 2: USB-UART conversion cable is disconnected from PC</p> <p>Solutions:</p> <ul style="list-style-type: none"> - In case an error occurs during the FW update process, the "USB Reset" button will appear after clicking any of the buttons ("Connected/Select/Download" button). To restart the firmware update, the user must first reconnect the USB-UART conversion cable, then click the "USB Reset" button to reset the USB connection. Refer to the 2nd picture for details. - Alternatively, after reconnecting the USB-UART conversion cable, close and restart the PC GUI to initiate the firmware update again.
4	<p>After clicking the "Select UPD .bin file" button, the error message displays: "UPD file Error! Please check and select correct UPD file."</p>	<p>Possible Issue: The UPD file is not the target file</p> <p>Solutions: User needs to select correct UPD file to do FW update.</p>

Revision History

Ver.	Date	Revised Contents
1.00	2 nd Aug 2024	1. Initially issued.
1.10	18 th Oct 2024	1. Add Chapter 2.2 Power Up