

Reference Design Programming Board

User Guide

SUMMARY: The Atmosic Reference Design Programming Board (RPB) provides a host computer access to some commonly needed development and debug interfaces on an Atmosic wireless SoC based Evaluation Board or other target hardware.



Atmosic™

Doc. No. ATM-UGRPB-P051

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Acronyms and Abbreviations

| Acronyms | Definition |
|----------|------------------------------------|
| ATM33 | ATM3325 ATM3330 ATM3330e |
| BBOOT | Benign Boot |
| DTM | Direct Test Mode |
| DUT | Device Under Test |
| EVK | Evaluation Kit |
| FFC | Flexible Flat Cable |
| FW | Firmware |
| HCI | Host Controller Interface |
| OB | On Board |
| OTA | Over-The-Air |
| PWD | Powerdown |
| RDB | Reference Design Board |
| RDI | Reference Design Interface |
| RDK | Reference Design Kit |
| RPB | Reference Design Programming Board |
| SDK | Software Development Kit |
| SoC | System-on-Chip |
| SWD | Serial Wire Debug |

1. Overview

The Atmosic RPB provides host computer access to some commonly needed interfaces on an Atmosic SoC based DUT. These interfaces include:

- SWD
- Debug UART
- 4-wire HCI UART or 2-wire for DTM
- Reset / PWD and Boot Mode signals

The RPB is included as part of the RDK such as PV Keyboard, PV Remote Control, TAG, etc. The RPB can be ordered separately if needed, see [Table 1](#).

| Board | Part Number |
|------------------------------------|-------------|
| Reference Design Programming Board | ATMRPB-FJ |

Table 1 - Reference Design Programming Board Ordering Information

2. RPB Description

[Figure 1](#) shows the main components on version 083-10 (V1) of the RPB (ATMRPB-FJ-02).

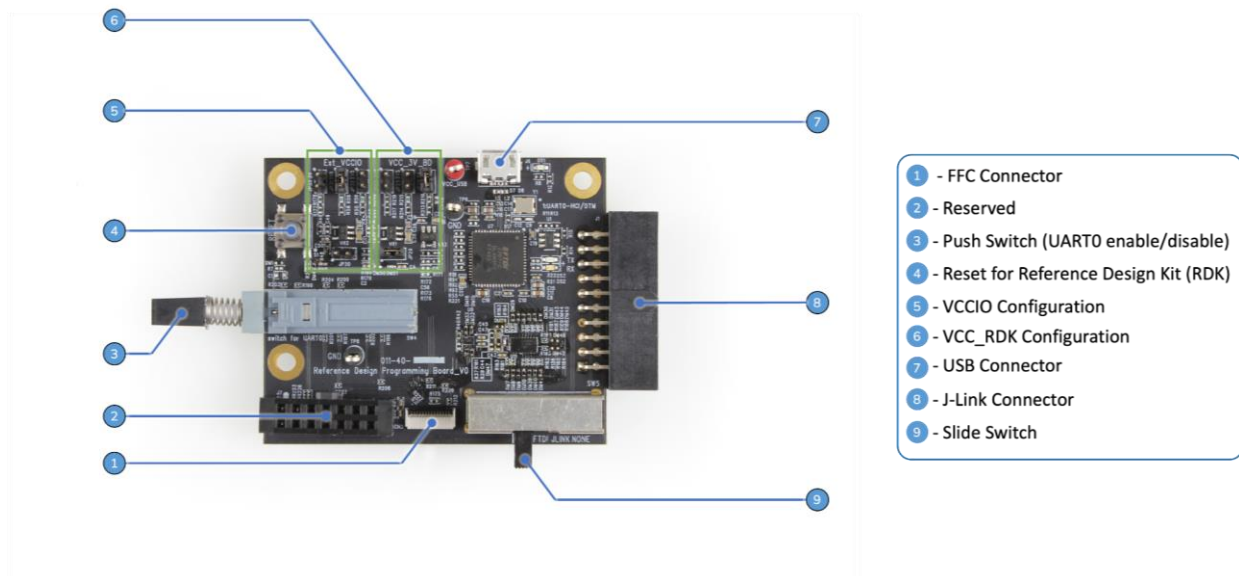


Figure 1 - RPB Version 083-10 (V1)

Following is description for each section of the RPB

- USB Connector: This is a micro-USB port that is connected to the host computer to FTDI FT4232H on RDK, which provides 3 serial ports. This should show up as Atmosic RDI USB1 port in Windows Device Manager, and /dev/ttyUSBxxx in Linux.
 - Port 0: Debug UART (UART1 of ATM33)
 - Port 1: Console UART (UART0 of ATM33)
 - Port 2: SWD
- Slide Switch - The switch can be used to control SWD interface/BBOOT and PWD signal to different connectors according to different user cases, as shown in [Figure 2](#).
 - Interfaces controlled by Slide Switch
 - SWD interface: SWD_IO and SWD_CLK
 - BBOOT (Benign Boot : pull high to keep CPU in an idle mode state, which is controlled by FTDI chip here with SDK.
 - PWD : Power down input pin of ATM33, which can be used to reset RDK.
 - Based on the switch selection, the interfaces (listed above) will be connected to FTDI chip, J-LINK or NONE:
 - FTDI option : FTDI interface of FT4232 can be used for FW programming through USB connector.
 - JLINK option : J-LINK dongle will be connected to the J-LINK connector of RPB for FW programming.
 - NONE option : This option is to make SWD/BBOOT/PWD floating when the interfaces need to be kept open in normal application use cases. For example, the Slide Switch needs to be in FTDI or JLINK position during FW programming, but needs to be in NONE position during the RDK normal operations even when the RPB is connecting to the RDK.
 - When the Slide Switch is moved to the left position , interface signals will go to FTDI; when the Slide Switch is at the middle position, interface

signals will go to J-LINK connector; when Slide Switch is moved to the right position, Interface signals will be kept floating. (See in [Figure 2](#).)

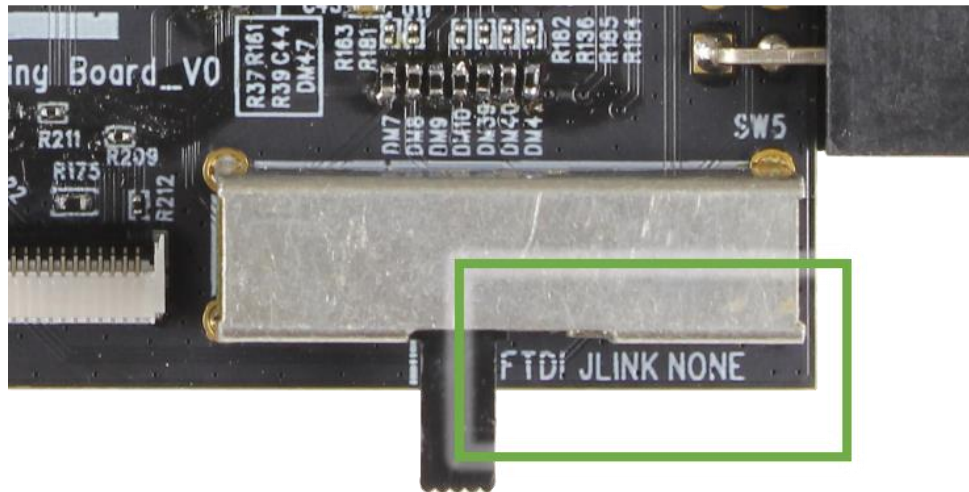


Figure 2 - Slide Switch

- Board Connectors: There are two options to connect the RRB to an Atmosic RDK board:
 - FFC Connector: This is a 1x14 14-pin female interface. The connector is included in the Atmosic RDK package. FFC cable will be used to connect RDK and RPB. [Figure 3](#) shows an example of Tag RDK connected to the RPB through the FFC Connector . See [Figure 4](#) for FFC Connector circuit.

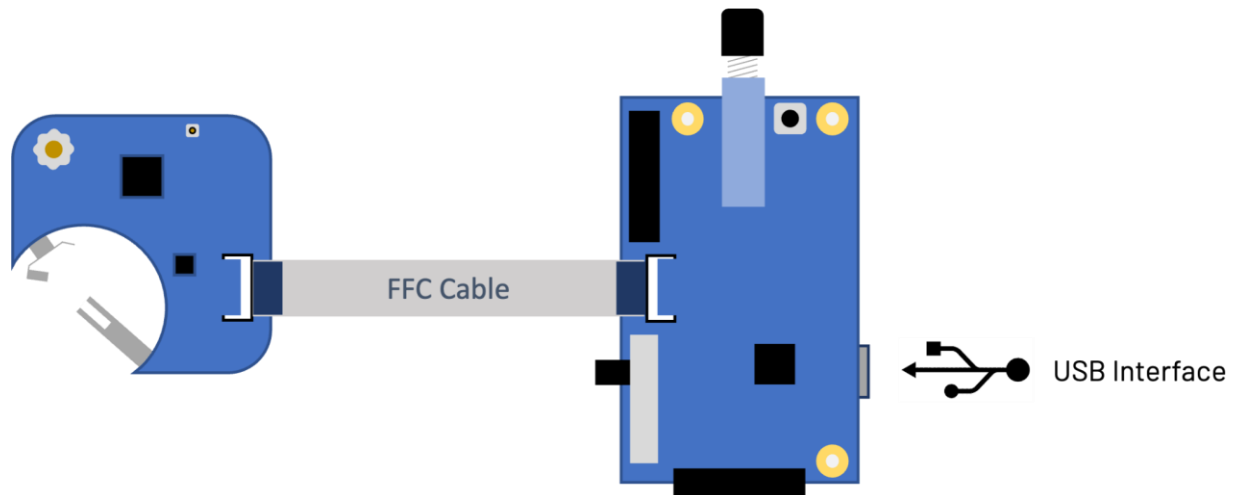


Figure 3 - Connection Between Tag RDK and RPB

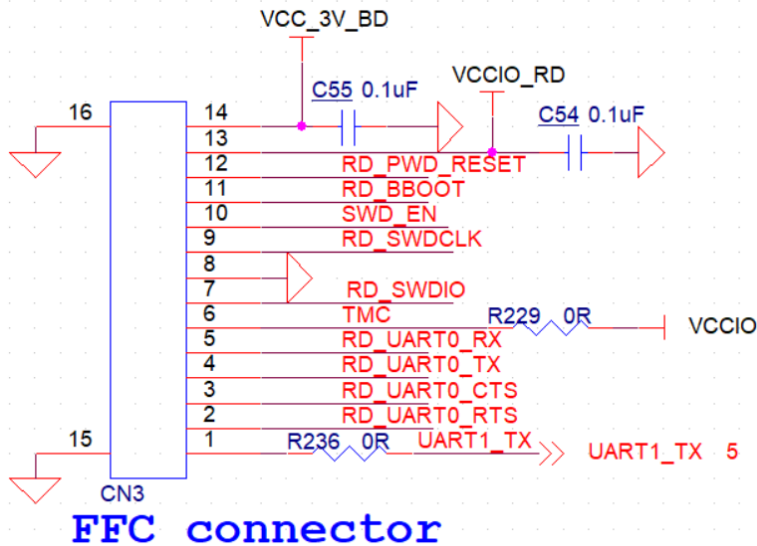


Figure 4 - 1x14 FFC Connector Circuit

- Auxiliary Connector: This is a 2.54 mm pitch 2x7 14-pin female interface designed to connect directly to a customer board without an FFC connector. (For example, on a customer design where only test points are available due to board size constraints, the Auxiliary Connector can be used for connection with test points). Customers also have the option to ‘fly-wire’ the interface connection through this connector. See [Figure 5](#) for Auxiliary Connector circuit.

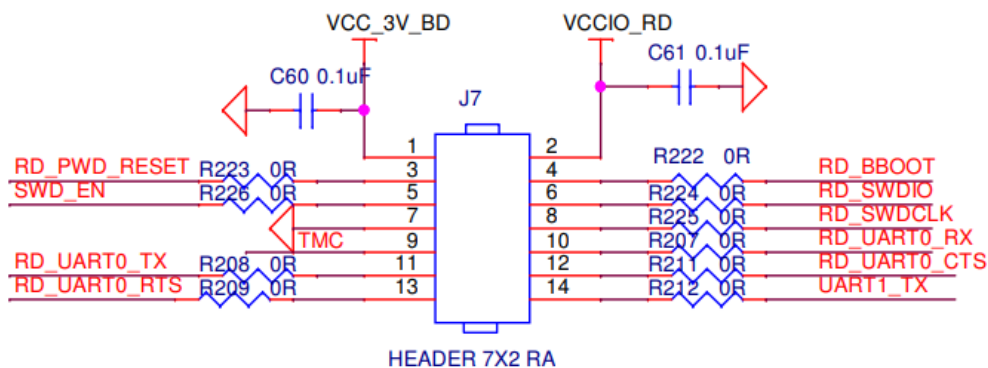


Figure 5 - 2x7 14-pin Auxiliary Connector Circuit

- J-LINK Connector: This is a 2.54 mm pitch 2x10 20-pin female interface, side launch designed to connect directly to an J-LINK dongle for FW programming. See [Figure 6](#) for J-LINK Connector circuit.

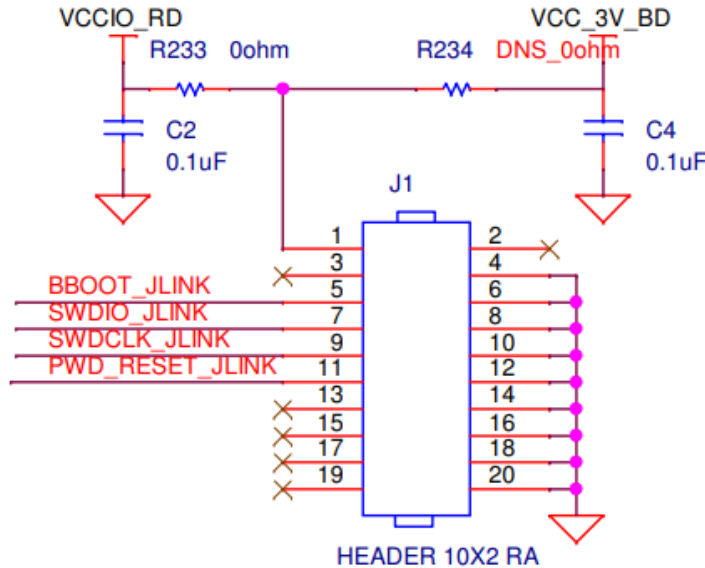


Figure 6 - 2x10 pin J-LINK Connector Circuit

- VCCIO Source Selector (shown in [Figure 7](#)): These jumpers allow the VDDIO of RDB to use either the I/O supply on the Atmosic RDB or through external VCCIO source circuits. 2.5 V is set as the default on VCCIO domain, and 1.8 V and 3 V can be supported after DM38 removed and jumpers installed. Jumper JP30 is used to connect VCCIO voltage domain and VDDIO of Atmosic RDK. JP30 should be kept open in most use cases. One scenario where JP30 needs to be installed is for OTP programming.

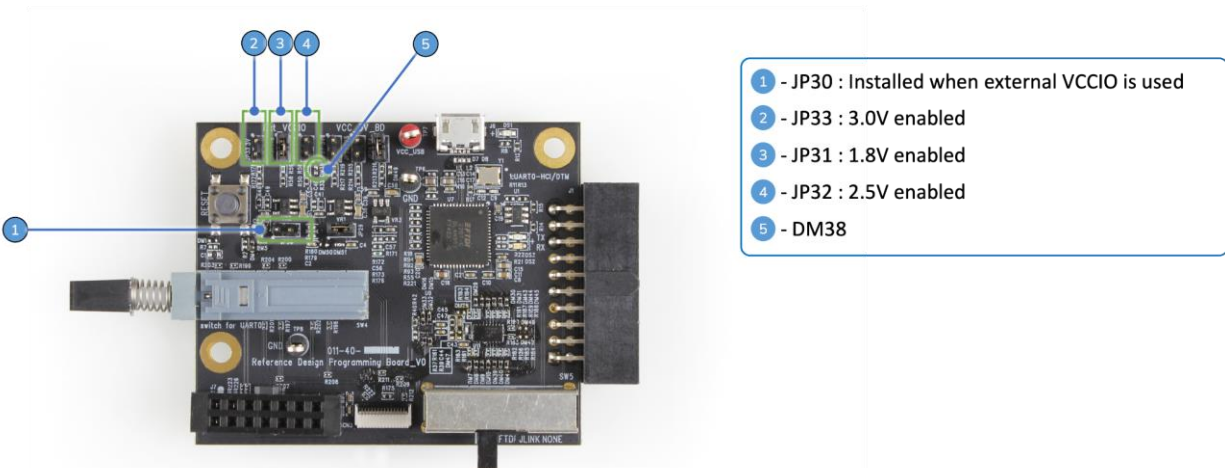


Figure 7 - Detail for VCCIO External Source Section

- DM38 is by default installed with a 0 Ω resistor to make 2.5 V the default option. In the case where a different voltage plan will be used, DM38 must be removed first, and then a voltage jumper needs to be installed (JP31/JP32/JP33), before the USB cable is plugged in.
- JP30 needs to be installed when an external VCCIO source is used. If VDDIO of RDK does not need to be changed, JP30 should be kept open.
- VCC_RDK Source Selector (VCC_3 V section): These jumpers allow the RDK to use the VCC supply on the Atmosic RDB or through external VCC source. 3 V is set as default, and 2.5 V and 3.6 V can be supported after DM49 is removed and jumpers installed as shown in [Figure 8](#).

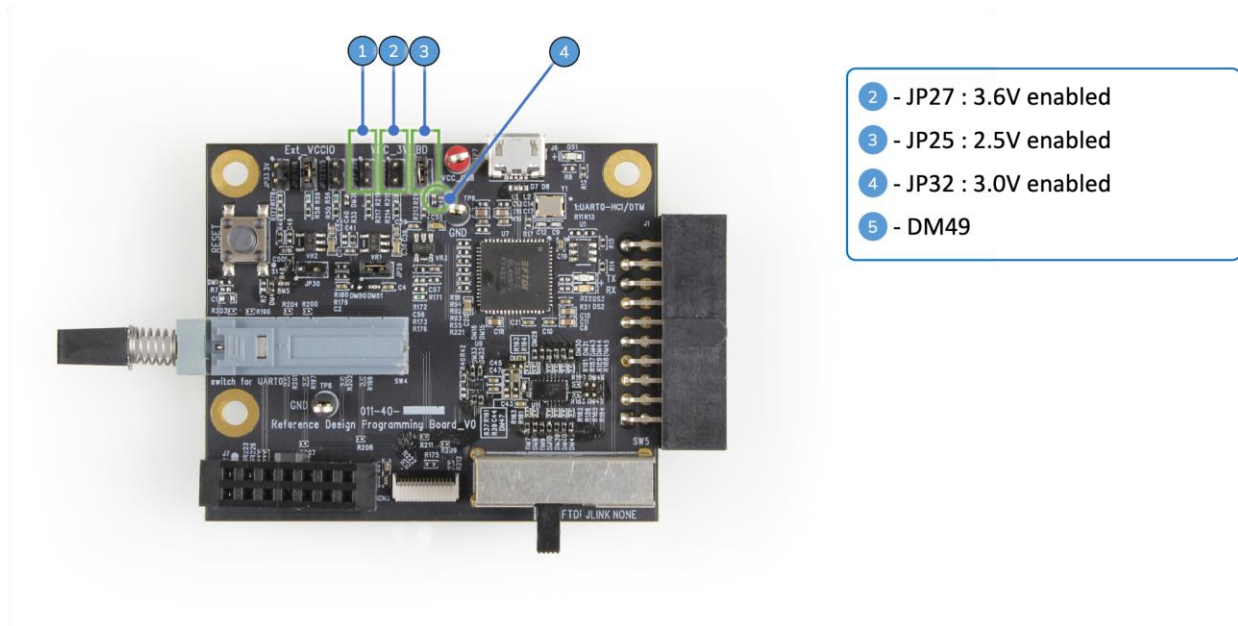
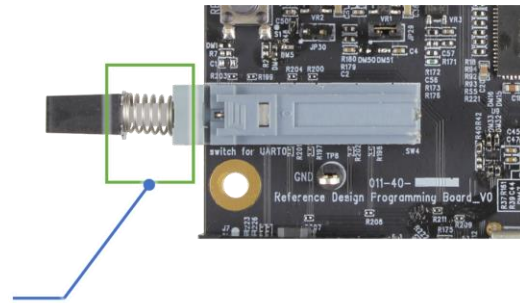


Figure 8 - Detail for VCC Source Section

- DM49 is by default installed with a 0 Ω resistor to make 3 V as the default option. In the case where a different voltage plan will be used. DM49 must be removed first, and then a voltage jumper needs to be installed (JP25/JP26/JP27), before the USB cable is plugged in.
- Push Switch : The switch is used to enable or disable UART0 (Console UART) interface of Atmosic RDK, see [Figure 9](#).



Switch Spring

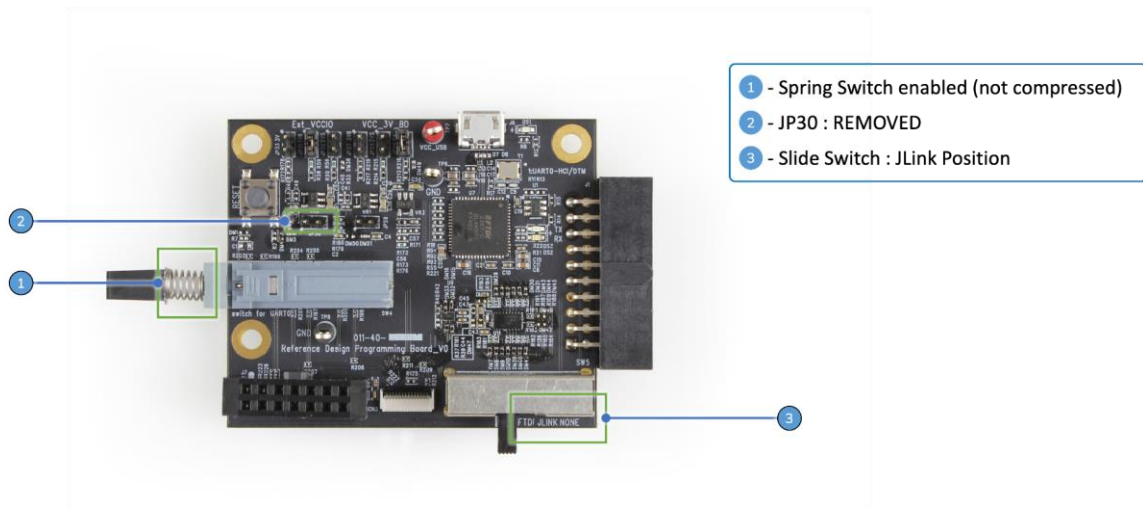
- When spring compressed, UART0 is disabled
- When spring is not compressed, UART0 is enabled

Figure 9 - Push Switch for UART0 Control

3. ATM33 RDK Firmware Update

There are few sections on the RPB that need to be configured correctly for firmware programming and debug LOG checking as shown in [Figure 10](#).

- Keep JP30 open (no jumper installed).
- Make sure the Slide Switch is moved to the correct location. It should be either at the FTDI position (most common) or JLINK position.
- Push Switch needs to be in the 'enabled' position, as shown in [Figure 10](#).
- Connect RDK to RPB using FFC cable.
- Then connect RPB to the host PC through the USB connector.



Switch Spring

- When spring compressed, UART0 is disabled
- When spring is not compressed, UART0 is enabled

Figure 10 - Jumper Configuration of RPB When Programming FW

3.1 ATM33 Firmware Update with Atmosic SDK

Support for firmware programming and debug output requires the installation of the latest SDK from the Atmosic Support website. Once the SDK is installed, connect the USB port of the RPB to the PC and install the RDI interface driver from the installed SDK folder, which will generate three consecutive COM ports and one USB device in the laptop which can be checked from the device manager of the host PC.

The generated USB device called **Atmosic MFG (Interface 0)** is used for firmware upgrading in the SDK MSYS window. For firmware upgrade with the RPB, customers need to add an additional build option when building the image: SWDBOARD=DL SWDIF=FTDI, in addition to the BOARD build option.

- Following are examples showing different build options:
 - Image updating on ATM3330e EVK with J-Link on-board (J-LINK OB), or Image updating on RDK through J-LINK connector on the RPB:

```
<user>/c/AtmosicSDK/5.4.0.1/platform/atm33/ATM33xx-5/examples/HCI_vendor  
$ make clean run_all BOARD=ATMEVK_3330e_QN
```

- Image updating for ATM3330e-based RDK through FTDI on the RPB :

```
<user>/c/AtmosicSDK/5.4.0.1/platform/atm33/ATM33xx-5/examples/HCI_vendor  
$ make clean run_all BOARD=ATMEVK_3330e_QN SWDBOARD=DL SWDIF=FTDI
```

1st port of the three consecutive COM ports is the Debug Port and the debug logs (through UART1 of RDK) can be viewed from any serial port monitoring tool with the following settings:

- Baud Rate: 115200
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: None

2nd port of the three consecutive COM ports can be connected to the Atmosic RF Tool for RF testing through the UART0 interface of RDK. If the console LOG needs to be enabled during normal RDK operations, the console LOG message can be found on this port as well.

Refer to the [References](#) section for more information about the SDK and tools mentioned in this section.

3.2 ATM33 Firmware Update with MPTool

Another way to update firmware is to use the Atmosic MPTool. Atmosic MPTool is usually used in the factory during mass production. This tool can also be used in the development stage, for example, updating the RDK with an image (atm file) received from Atmosic FAE.

The MPTool uses the same hardware configuration and connection as the SDK. The only difference is to install the MFX driver included in the MPTool, not the RDI driver included in the SDK, see [Figure 11](#).

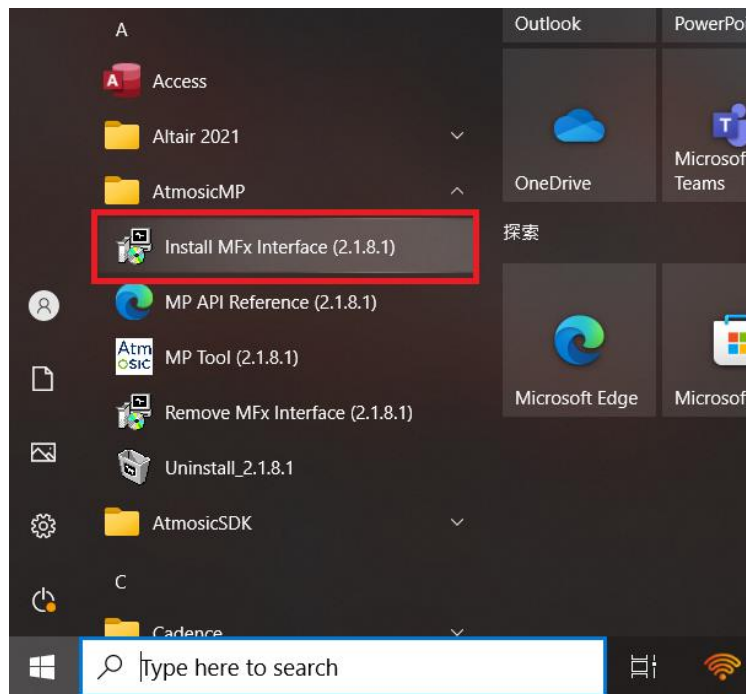
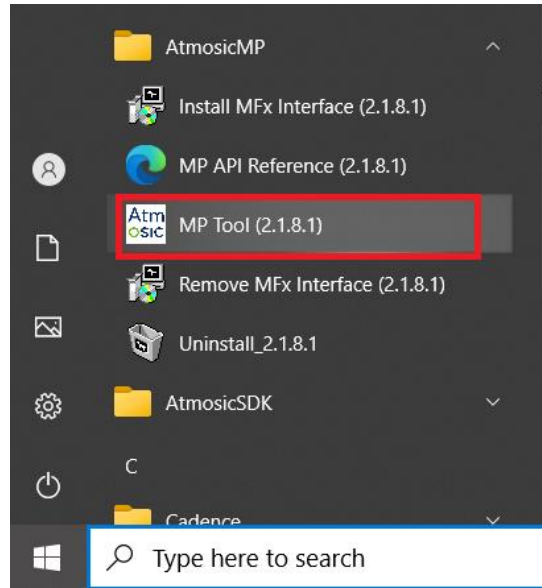


Figure 11 - Install MPTool Driver

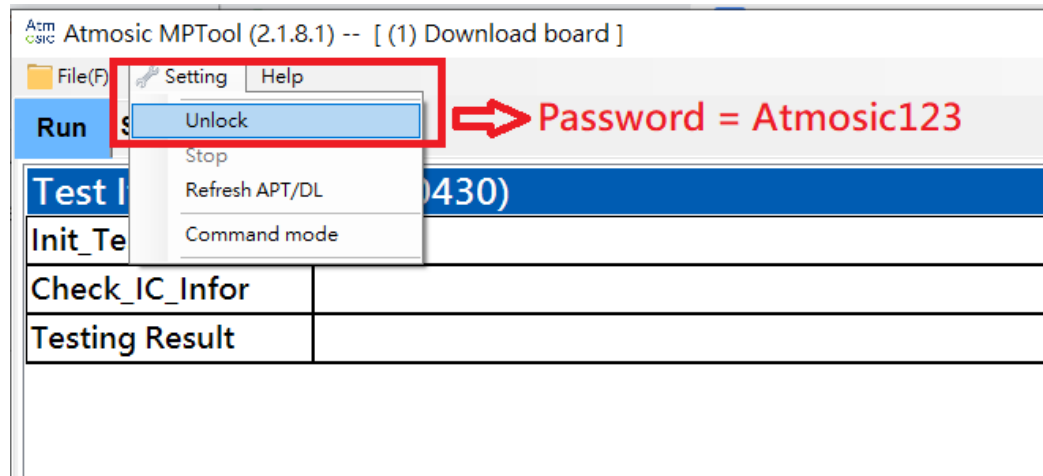
After the driver is installed, a USB device named **Atmosic MFG (Interface 0)** and COM port can be found in the Windows Device Manager.

Then launch MPTool and follow the steps below to program the firmware

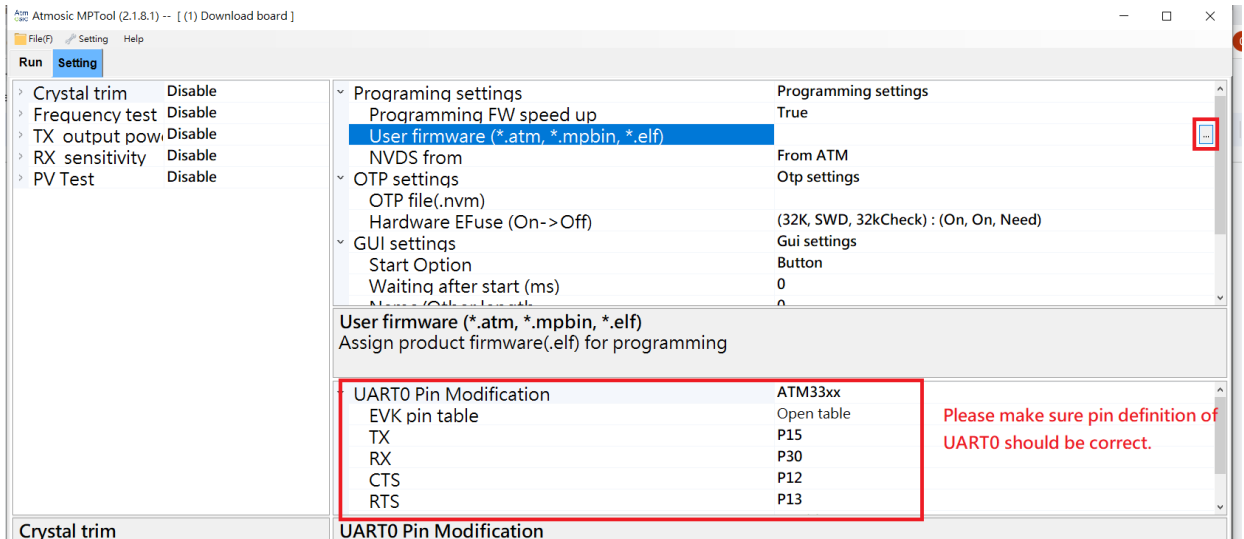
- Launch MPTool



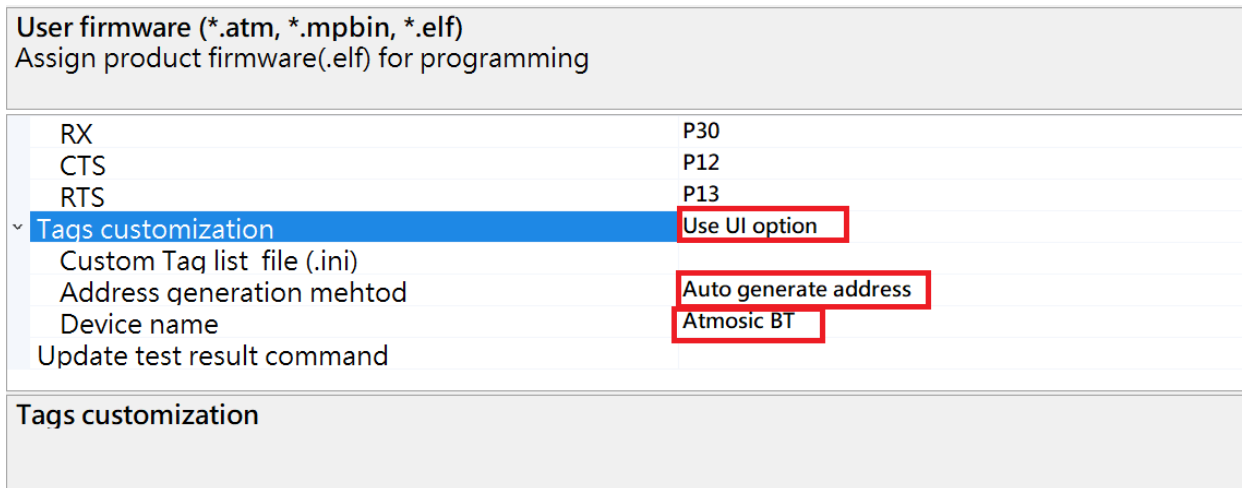
- Key in password **Atmosic123** to enable modification in setting page.



- Select target single image (atm file), and make sure the definition of UART0 pin is correct.



- Bluetooth address needs to be set as **Auto**, and device name (BT SSID) needs to be less than 7 bytes.



- Return To Run page and start FW programming, then check if the result is passed or fail.

Atmosic MPTool (2.1.8.1) -- [(1) Download board]

File(F) Setting Help

Run Setting

| | |
|----------------|--------------|
| Test Item | DUT(0430) |
| Init_Testing | |
| Check_IC_Infor | |
| BT Address | XXXXXXXXXXXX |
| Name/Other | XXXXXX |
| Testing Result | |

Main (0430)

```

[23:58:40] ----->Boot<-----
[23:58:41] Load config file from: C:\AtmosicMP\Test-Flow\mp_setting.xml failed!
[23:58:41] Factory state = InitMpSoftware
[23:58:41] Factory state = SearchingMpBoard
[23:58:42] Factory state = Wait4Start
    
```

Start Retry

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Appendix - Frequently Asked Questions

- 1) How to supply power to the RPB?
 - a) Connect a USB cable to a host computer (default and recommended method).
 - or
 - b) Connect a 5 V supply at the red loop and ground to any black loop
 - or
 - c) Connect a USB cable to a USB power adapter.

- 2) After firmware update, certain peripherals on the RDB are not working properly. For example, key matrix on Keyboard RDK, or buttons on Remote Control RDK.

Peripherals on the RDK may use the same GPIOs that are used by the various switches (SWD/UART) on the RPB. Disconnecting the various switches (SWD/UART) on RPB can help isolate the specific lines which may be used as GPIO input on the RDB.

Which means the Slide Switch on RPB should be set to NONE and UART Push Switch should be in compressed position (UART0 disabled) after firmware update.

- 3) Debug UART lines show garbage characters.

Sometimes the UART lines may not be pulled correctly due to the level shifter's bi-directional nature. When this symptom occurs, close and re-open tool may correct the issue.

References

| Title | Document number |
|--|-----------------|
| ATM33/e Series Evaluation Kit User Guide | ATM33_e-UGEVK |
| ATM33/e OTA Update Service User Guide | ATM33_e-UGOTA |
| RF Test Tool User Guide | ATM-UGRF |
| SDK User Guide | ATM-UGSDK |
| Hardware | Order Number |
| Reference Design Programming Board | ATMRPB-FJ |

Revision History

| Date | Version | Description |
|---------------|---------|-----------------------------------|
| July 24, 2023 | 0.51 | Format change, no content change. |
| June 9, 2023 | 0.50 | Initial version created. |



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