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.

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Acronyms and Abbreviations

Acronyms	Definition
ATM33/e	ATM3325 ATM3330 ATM3330e
ATM34/e	ATM3405 ATM3430 ATM3430e
BBOOT	Benign Boot
DTM	Direct Test Mode
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
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 commonly needed interfaces on an Atmosic SoC-based design. These interfaces include:

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

The RPB may be included as part of the RDB, 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

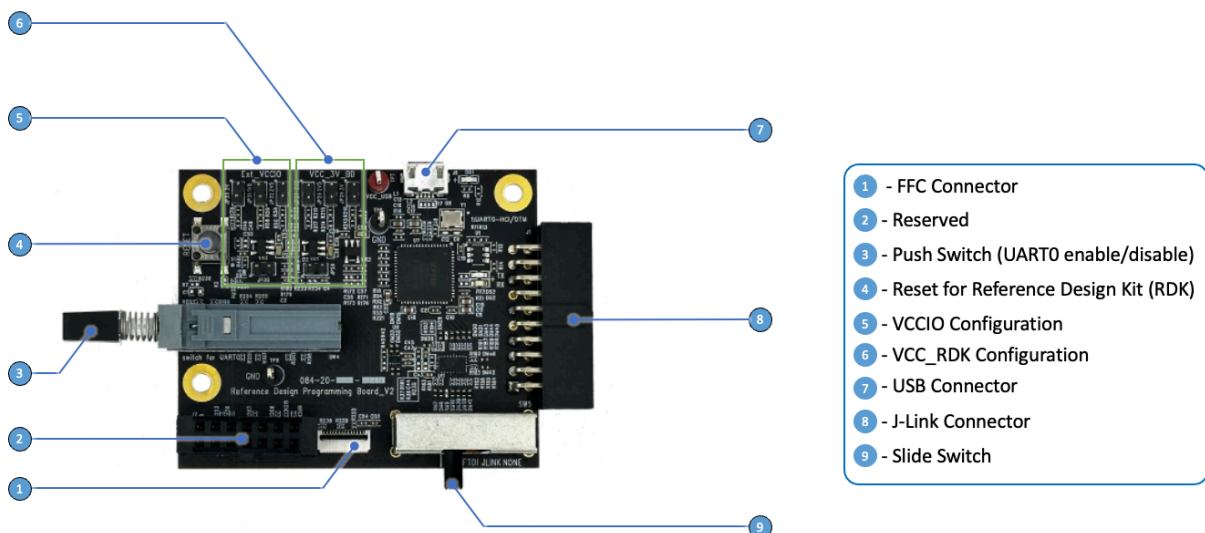Figure 1 shows the main components of version 084-20 (V2) of the RPB (ATMRPB-FJ).

1 - FFC Connector
2 - Reserved
3 - Push Switch (UART0 enable/disable)
4 - Reset for Reference Design Kit (RDK)
5 - VCCIO Configuration
6 - VCC_RDK Configuration
7 - USB Connector
8 - J-Link Connector
9 - Slide Switch

*Figure 1 - RPB Version 084-20 (**V2**)*

The following is a description of each section of the RPB.

- USB Connector: This is a micro-USB port connected to the host computer to the FTDI FT4232H, which provides 3 serial ports. This shows up as `Atmosic RDI USB1` port in Windows Device Manager, and /dev/ttyUSBxxx in Linux.

  - Port 0: Debug UART (UART1 of ATM33/ATM34)
  - Port 1: Console UART (UART0 of ATM33/ATM34)
  - Port 2: SWD

- Slide Switch (SW5): The switch controls the SWD interface, BBOOT, and PWD signals to different connectors according to the use cases, as shown in Figure 2.

  - Interfaces controlled by the Slide Switch

    - SWD interface: SWD_IO and SWD_CLK
    - BBOOT: Benign Boot controls the CPU state
    - PWD: Power down is an input pin that can be used to reset the ATM33/ATM34

  - Based on the switch selection, the interfaces (listed above) will be connected to the FTDI chip, J-LINK connector, or NONE. See Figure 2

    - FTDI: The FTDI interface of the FT4232H can be used for FW programming through the USB connector
    - JLINK: J-LINK dongle will be connected to the J-LINK connector of RPB for FW programming
    - NONE: This option isolates any connection to the SWD/BBOOT/PWD pins. 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 RDB normal operations, even when the RPB is connecting to the RDB
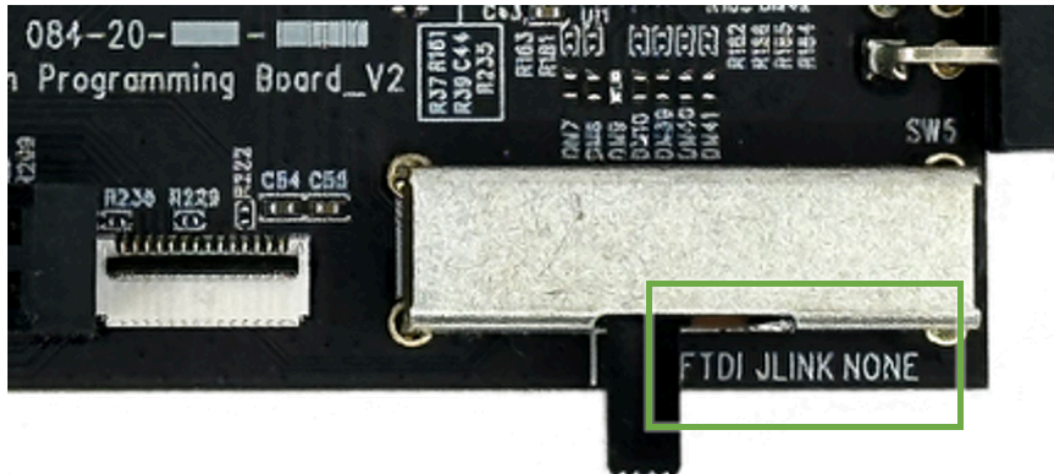
Figure 2 - Slide Switch

- Board Connectors: Two options exist to connect the RPB to an Atmosic RDB board.

  - FFC Connector: This is a 1x14 14-pin female interface. The connector is included in the Atmosic RDB. FFC cable will be used to connect the RDB and RPB. Figure 3 shows an example of the Tag RDB connected to the RPB through the FFC Connector. See Figure 4 for the FFC Connector circuit
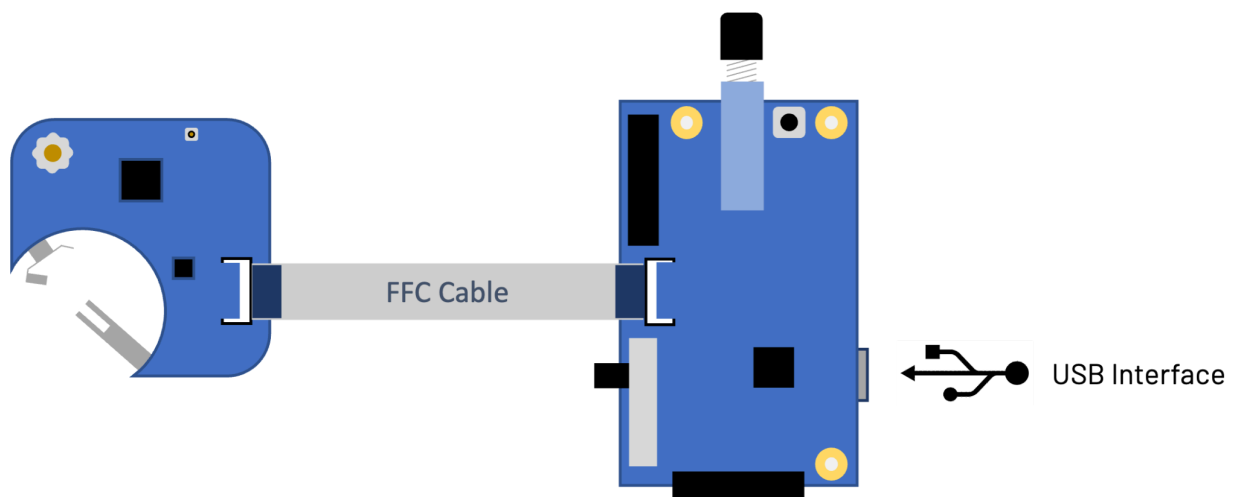

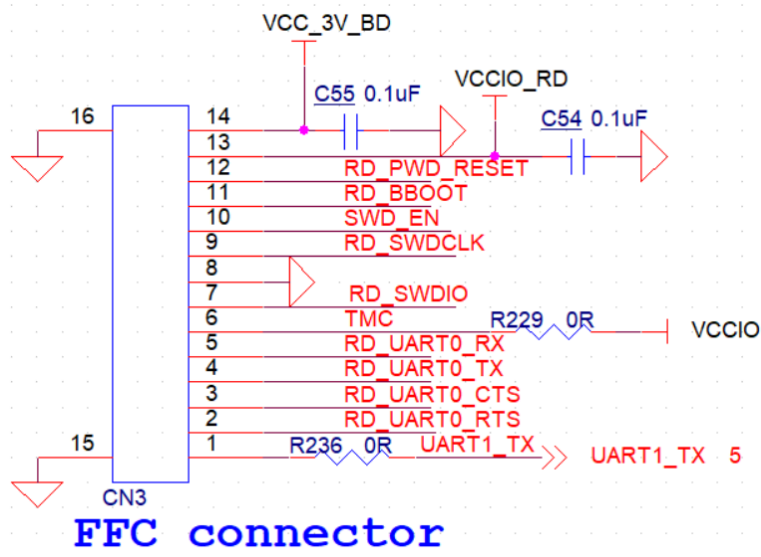*Figure 3 - Connection Between Tag RDB and RPB*

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 the Auxiliary Connector circuit
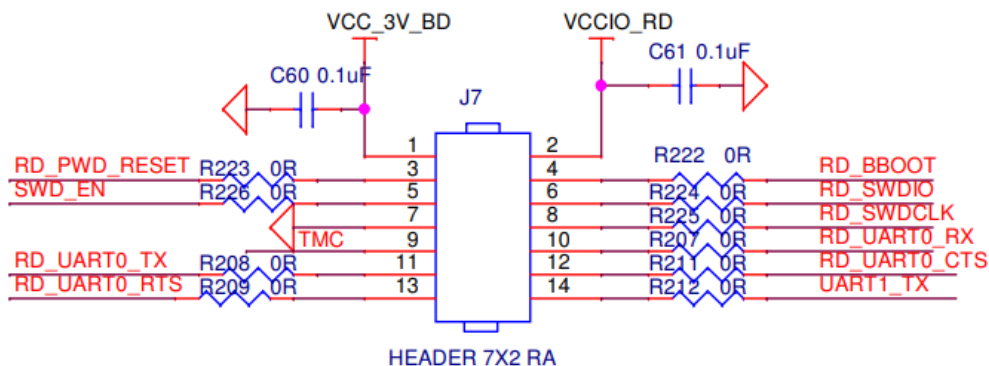

Figure 5 - 2x7 14-pin Auxiliary Connector Circuit

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

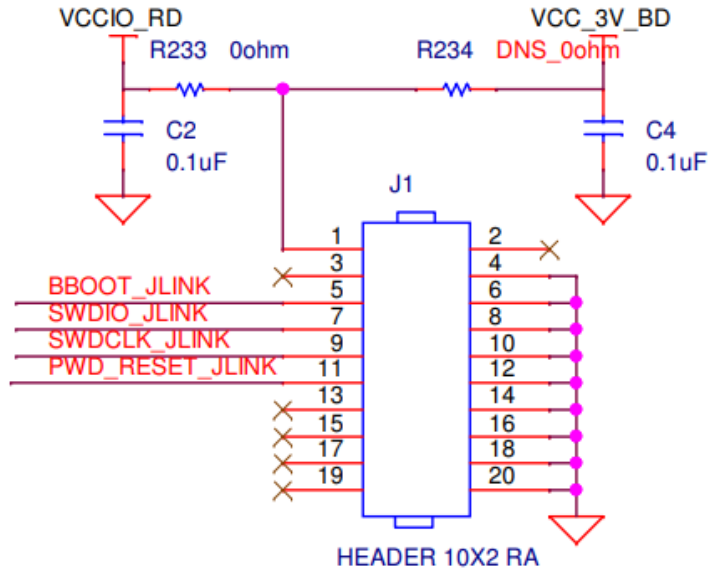*Figure 6 - 2x10 pin J-LINK Connector Circuit*

- 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 the VCCIO domain, and 1.8 V and 3 V can be supported after DM38 is removed and the jumper is installed. Jumper JP30 is used to connect the VCCIO voltage domain and the VDDIO of Atmosic RDB. JP30 should be kept open in most use cases. One scenario where JP30 needs to be installed is for OTP programming.
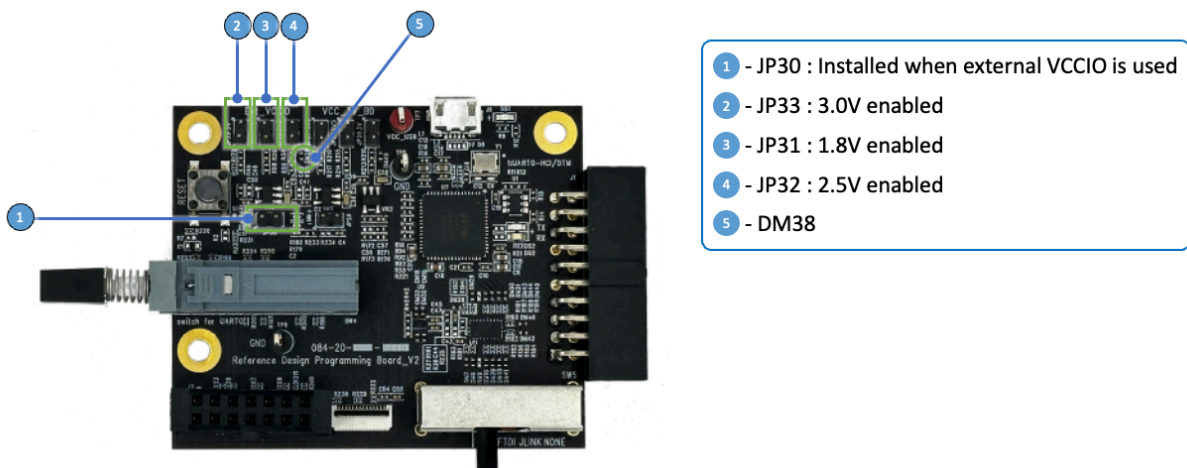

1 - JP30 : Installed when external VCCIO is used

2 - JP33 : 3.0V enabled

3 - JP31 : 1.8V enabled

4 - JP32 : 2.5V enabled

5 - DM38

Figure 7 - Detail for VCCIO External Source Section

- ○ DM38 is installed by default with a 0 Ω resistor to make 2.5 V the default option. In the case where a different voltage 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 the VDDIO of RDB does not need to be changed, JP30 should be kept open

- ● VCC_3V_BD Source Selector: These jumpers allow the RDB to use the VCC supply on the Atmosic RDB or through an external VCC_3V_BD source. 3 V is set as the default, and 2.5 V and 3.6 V can be supported after DM49 is removed and the jumper is installed as shown in Figure 8.
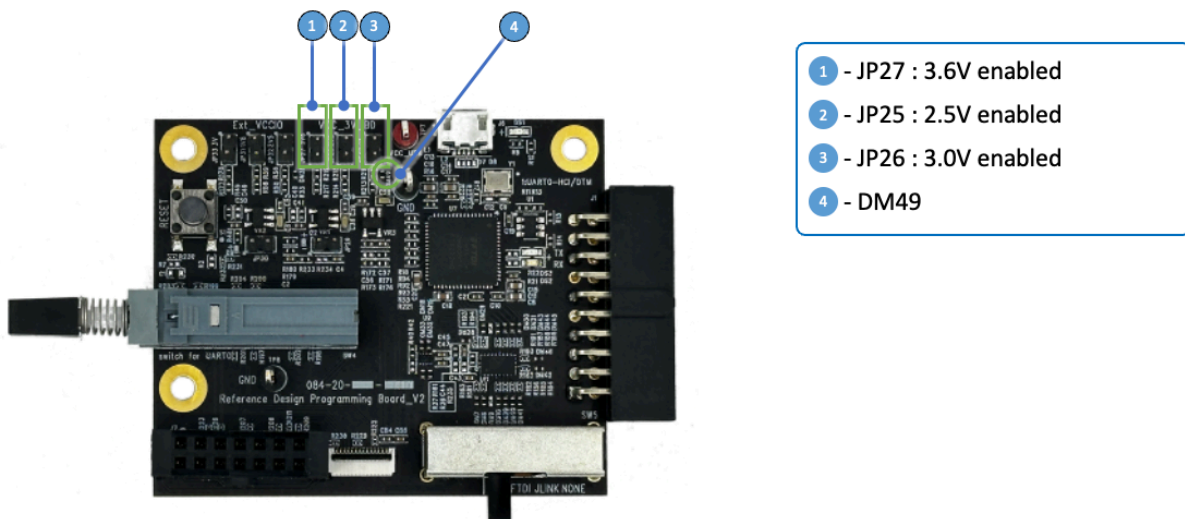

1 - JP27 : 3.6V enabled
2 - JP25 : 2.5V enabled
3 - JP26 : 3.0V enabled
4 - DM49

Figure 8 - Detail for VCC Source Section

- ○ DM49 is installed by default with a 0 Ω resistor to make 3 V the default option. In the case where a different voltage 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(SW4): The switch is used to enable or disable the FTDI chip to the UART0 interface of Atmosic RDB, see Figure 9.

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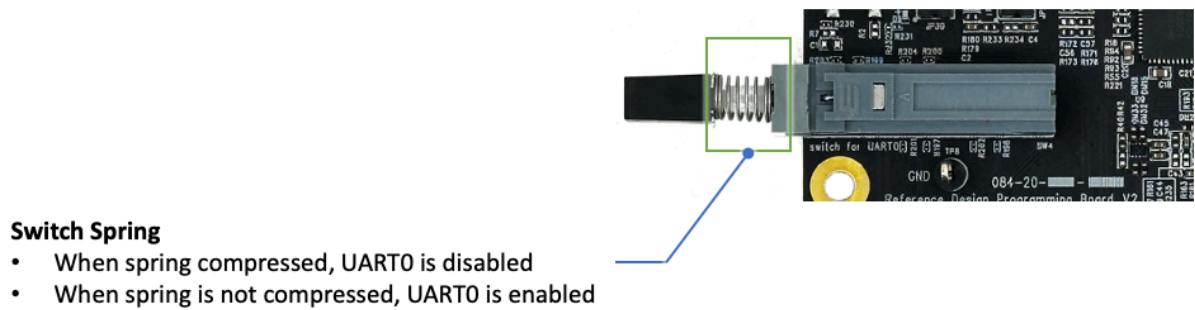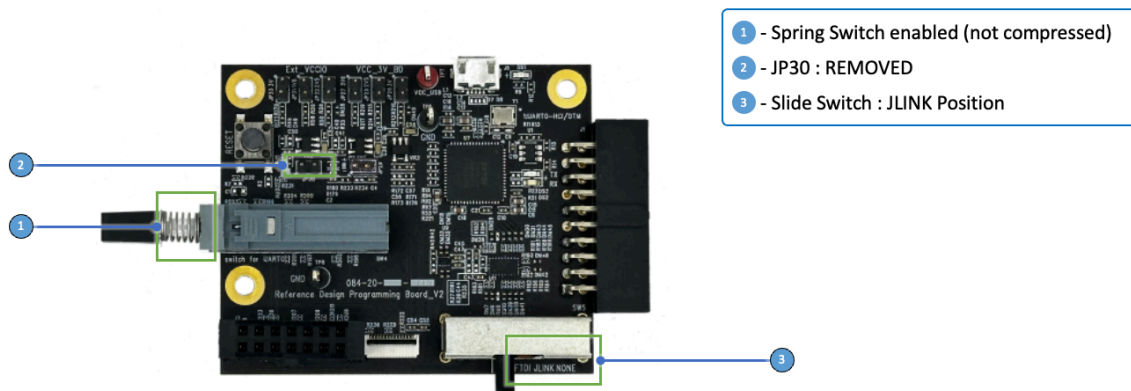- When spring is not compressed, UART0 is enabled

Figure 9 - Push Switch for UART0 Control

3. Programming with RPB

A few selections on the RPB need to be configured for firmware programming and debug console output to operate 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 the `JLINK` position.
- Push Switch needs to be in the 'enabled' position, as shown in Figure 10.
- Connect RDB to RPB using an FFC cable.
- Then connect RPB to the host PC through the USB connector.

1 - Spring Switch enabled (not compressed)
2 - JP30 : REMOVED
3 - Slide Switch : JLINK Position

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

Figure 10 - Jumper Configuration of RPB When Programming Firmware

3.1   ATM33 Programming with Atmosic Bare-Metal SDK

It is assumed the customer is familiar with programming the Atmosic EVKs using the bare-metal SDK with J-Link. The RPB uses an FTDI interface chip. The following commands are needed when using FTDI (`SWDBOARD=DL SWDIF=FTDI`).

- The following example shows the build/Flash commands needed when using the RPB to program:

```
$ make BOARD=ATMEVK_3325_TAG run_all SWDBOARD=DL SWDIF=FTDI
```

Refer to the References section for more information about the SDK and tools mentioned in this section.

3.2   ATM33/ATM34 Programming with Atmosic OpenAir SDK

It is assumed the customer is familiar with programming the Atmosic EVKs using the Zephyr West commands with J-Link to the Atmosic ATM33/ATM34. The following commands are needed when using FTDI (`SWDBOARD=DL`).

```
SWDBOARD=DL west flash --skip-rebuild --verify --device ATMDL22060000513
--fast_load --erase_all
```

Note: ATMDL22060000513 is the device ID assigned to the Programming Board. It can be obtained by issuing in Linux using the command `ls /dev/serial/by-id/`. In Windows, go to the Device Manager and right-click on one of the Serial Ports that were enumerated and select Properties. Then, select Events. The device ID will be displayed in the Information section.

Appendix - Frequently Asked Questions

1) How to supply power to the RPB?

   a) Option#1: Connect a USB cable to a host computer (default and recommended method)
   b) Option#2: Connect a 5 V supply to the red loop and ground to any black loop

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

   Peripherals on the RDB 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 that may be used as GPIO input on the RDB.

   Which means the Slide Switch on RPB should be set to NONE, and the 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, closing and reopening the tool may correct the issue.

References

Title	Document number
ATM33/e Series Evaluation Kit User Guide	ATM33_e-UGEVK
ATM34/e Series Evaluation Kit User Guide	6441-xxxx-xxxx
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
January 7, 2026	0.53	Updated with v2 board pictures and information
October 27, 2025	0.52	Added ATM33/ATM34 Programming with Atmosic OpenAir SDK
July 24, 2023	0.51	Format change, no content change.
June 9, 2023	0.50	Initial version created.

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