Specification For Telink TLSR8232-based BLE Audio Remote Control Demo

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Brief：

This document is a product specification for Telink BLE (Bluetooth Low Energy) Remote Control demo based on the TLSR8232 SoC.

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Revision History

Version	Major Changes	Date	Author
1.0.0	Initial version	2018/3	Gaoqiu, Wangsihui, Cynthia

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1   Introduction

In this document, the BLE remote control (RC) specification is described in details for one sample use case built on Telink's TLSR8232F512 platform.

1.1   Supported features

The RC demo supports the following features:

- works with dual batteries
- 23 **valid** buttons and 2 indicating LEDs
- OTA firmware upgrade
- PC tool for button display and demonstration

1.2   Electrical specification

Current consumption for the RC demo is shown as below:

- Button press: 0.5~1.3mA
- Short suspend*: 0.008~0.26mA
- Long sleep: 1.4uA

Working distance:

- Button press: >30m

***Note**: These numbers may vary depending on the host side BLE solution provider and the operating system configurability.

1.3   Button layout

The RC demo supports 23 valid buttons as shown in Figure 1, including:

- ✧ Power
- ✧ Sleep
- ✧ Up
- ✧ Down
- ✧ Left
- ✧ Right
- ✧ OK
- ✧ Home
- ✧ Menu
- ✧ Return
- ✧ Vol+
- ✧ Vol-
- ✧ Mute
- ✧ 0-9 Digits

Other buttons on the RC demo are reserved for future use. For example, the "Learn" button on the RC can be extended for IR learning function (please refer to **Section 7**).

Figure 1   Telink BLE RC demo

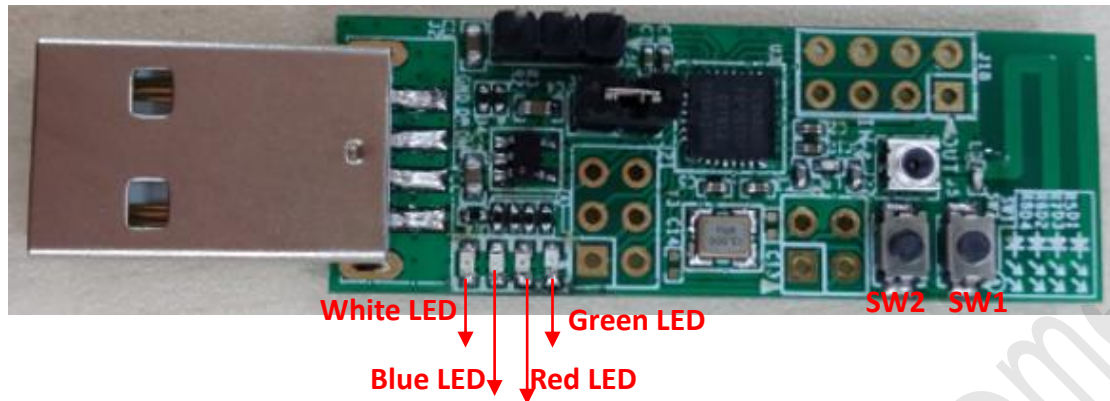The Telink sample BLE dongle is shown in Figure 2.

Figure 2 Telink Sample BLE Dongle

2   Factory Test Mode

The Telink Sample RC supports factory test mode.

Press the specific combination buttons (e.g. press 1+2+3 digital buttons at the same time), power on the RC with the buttons held, the indicating LED of the RC will blink (e.g. blink 2 times with 1Hz frequency) to indicate the RC enters factory test mode.

In factory test mode, the RC won't send pairing/adv packet unless specific button (e.g. "Power") is clicked. This mode is used to test key values in a controlled way (e.g. user can determine when to send pairing/adv packet).

The RC will exit factory test mode and enter normal state by clicking specific button (e.g. "Mute").

3   Factory Reset Mode

Factory reset mode is customizable depending on user's requirement, and it's not supported by all RC demos.

After the RC is powered on, if it's not connected to the demo dongle, the factory reset mode (if supported) can be triggered by pressing the specific combination buttons (e.g. Home + Left) for several seconds (e.g. 3s). The indicating LED of the RC will blink several times (e.g. 3 times) to indicate the RC is reset to its factory default state.

4   Pairing and Un-pairing

NOTE: The RC needs to be paired with the demo dongle before it can be used. Telink samples provided to customers are already paired, so the pairing steps in this section can be skipped.

Before pairing operation, both the RC and Dongle should be burned with the right firmware, respectively. Telink-supplied RC and Dongle samples are preloaded with FW already. If user needs to update the FW, please follow the operations as described in "***AN_FBD-EVK-UG_Firmware burning and debugging User Guide***".

Telink BLE RC supports two customizable pairing and un-pairing methods.

4.1   Method 1: initiated by dongle side

4.1.1   Pairing the RC and the dongle

The pairing operation is as shown below:

1)   Power on the BLE RC. Insert the BLE Dongle into PC USB.

2)   Click the "SW1" button of the BLE Dongle to start pairing process.

3)   The red LED light on the BLE Dongle will be turned on and keep the state always to indicate successful pairing.

4)   After power cycle the paired RC/Dongle, it's not needed to click the "SW1" button again and the RC will be paired with the Dongle automatically.

5) After the BLE RC is successfully paired with the Dongle, if the RC is powered down or the communication is disconnected, the white indicating LED light on the Dongle will also be turned on. Power on the RC again or reestablish the communication, the white light will be turned off.

4.1.2 Un-pairing

Once paired with the Dongle, the RC can be manually unpaired by using the following sequence:

1) Click the "SW2" button of the BLE Dongle to start un-pairing process.

2) The red LED light on the BLE Dongle will be turned off to indicate successful un-pairing.

4.2 Method 2: initiated by RC side

4.2.1 Pairing for the first time

For a RC (RemoteA) and a dongle (DongleA) which are never paired, the pairing operation with dongle powered on first is as shown below:

1) Power on the DongleA.

2) Power on the RemoteA.

3) Click specific button (e.g. "**Home**") of the RemoteA to initiate pairing, and its LED will start blinking with 1Hz frequency.

   *Note: Pairing for the first time is only triggered in non-connection (advertising) state.

4) If the RemoteA is successfully paired with the DongleA within 60s, the LED of the RemoteA will blink 2 times with 2Hz frequency, and the red LED of the DongleA will be turned on.

5) If the RemoteA fails to pair with the DongleA within 60s, the LED of the RemoteA will be turned off after the 60s timeout and the RC will enter deep sleep.

6) After successful pairing, power cycle the RemoteA or/and DongleA, the RemoteA will be automatically connected with the DongleA.

4.2.2 Un-pairing

When the RC (RemoteA) is paired with the Dongle (DongleA) and they're in connection state (i.e. the red LED of the Dongle is turned on), the RC can be manually unpaired from the Dongle by using the following sequence:

1) Press specific combination buttons (e.g. "1" + "Mute") of the RemoteA and hold for 3s to initiate un-pairing.

   *Note: In non-connection (advertising) state, the un-pairing can't be triggered.

2) If un-pairing is successful, the red LED of the DongleA is turned off, and connection between the RemoteA and DongleA is terminated.

3) If un-pairing fails, the red LED of the DongleA keeps its "ON" state.

4) After successful un-pairing, power cycle the RemoteA or/and DongleA, the RemoteA can't be automatically connected with the DongleA.

4.2.3 Re-pairing

When the RC (RemoteA) is paired with the Dongle (DongleA) and both are powered on, the DongleA can be re-paired with another RC (RemoteB) which is not paired with other Dongle currently according to the sequence1.

Sequence1:

1) Power down the RemoteA or un-pair the Dongle A from the RemoteA.

2) Power on the RemoteB.

3) If the RemoteB has never been paired, click the "**Home**" button of the RemoteB to initiate pairing. Please refer to **section 4.2.1**.

4) If the RemoteB has ever been paired, press the "**Home**" and "**OK**" buttons of the RemoteB and hold for 3 seconds to initiate re-pairing. The LED of the RemoteB starts blinking with 1Hz frequency.

5) If the RemoteB is successfully paired with the DongleA within 60s, the LED of the RemoteB will blink 2 times with 2Hz frequency, and the red LED of the DongleA will be turned on.

6) If the RemoteB fails to pair with the DongleA within 60s, the LED of the RemoteB will be turned off after the 60s timeout, and the RC will enter deep sleep.

7) After successful re-pairing, power cycle the RemoteB or/and DongleA, the RemoteB will be automatically connected with the DongleA.

When the RC (RemoteA) is paired with the Dongle (DongleA) and both are powered on, the RemoteA can be re-paired with another Dongle (DongleB) which is not paired with other RC currently according to the sequence2.

Sequence2:

1) Power down the DongleA or unpair the RemoteA from the DongleA.

2) Power on the DongleB.

3) Since the RemoteA has ever been paired, press the "**Home**" and "**OK**" buttons of the RemoteA and hold for 3 seconds to initiate re-pairing. The LED of the RemoteA starts blinking with 1Hz frequency.

4) If the RemoteA is successfully paired with the DongleB within 60s, the LED of the RemoteA will blink 2 times with 2Hz frequency, and the red LED of the DongleB will be turned on.

5) If the RemoteA fails to pair with the DongleB within 60s, the LED of the RemoteA will be turned off after the 60s timeout, and the RC will enter deep sleep.

6) After successful re-pairing, power cycle the RemoteA or/and DongleB, the RemoteA will be automatically connected with the DongleB.

*Note: Re-pairing process is only triggered in non-connection (advertising) state.

5   Button Function

After the BLE RC is successfully paired with the Dongle, the RC can send certain key value by pressing corresponding button. The function of each button is shown as in **Section 1.3**.

To test the simple button input, no special PC tool is needed. User can open up Notepad on the PC with the dongle plugged in, key presses such as 1, 2, 3, …, will be directly taken as input to the text file.

User can also use PC tool (KeySimulator) to simulate button press, release and repeat on the RC.

6   IR/BLE Mode Switch

The RC demo has IR hardware built in and IR functions loaded.

The RC demo supports two modes including BLE mode and IR mode, and it enters BLE mode by default after power on. User can click the "Sleep" button to switch mode between IR and BLE. When the RC enters deep sleep, the current mode is stored; after wakeup triggered by button press, the RC will be restored to the previous mode.

In IR mode, all buttons can send out corresponding IR key code by pressing the button.

7   IR Learning

IR learning function is customizable depending on user's requirement, and it's not supported by all RC demos.

- Press specific button (configurable, e.g. "Learn" button) on Telink RC with IR learning support, and hold the button for 3s (configurable) until the indicating LED on the RC is turned on.

- Press specific IR learning button (e.g. "Power" button) on the RC to trigger IR learning mode. The indicating LED on the RC starts blinking.

- When the indicating LED on the learning RC is blinking, align its IR emitter with the "Power" button on the target RC which is to be learned, and keep the distance as 2~3cm. Press the "Power" button on the target RC to send out corresponding key code.

- After the learning RC obtains the key code of the "Power" button on the target RC, its indicating LED will slowly blink 3 times to indicate successful IR learning.

- During IR learning process, the RC can exit the mode by pressing any button other than the IR learning button (i.e. "Power" button).

8   Repeatable Buttons

Depending on user's requirement, Telink BLE RC supports repeatable buttons for the following group of buttons:

- Left

- Right

- Up

- Down

- VOL+

- VOL-

In BLE mode, when any of the buttons is pressed and held, the key value will be sent with 250ms (configurable) interval.

All the other buttons are treated as non-repeatable keys.

9   Low Battery Detect

Telink RC sample supports the function to detect low battery voltage.

The implementation method is customizable depending on user's requirement. One typical implementation is shown as below:

1)   When battery voltage drops below 2.1V (2.0V~2.1V), the indicating LED

(Power LED) of the RC will keep blinking slowly;

2) When battery voltage drops below 2.0V (1.9V~2.0V), the indicating LED of the RC will keep blinking fast;

3) When battery voltage drops below 1.9V, the RC will enter cut-off mode and stop working. In this case, user should replace the battery.

*Note: The indicating LED blinking frequency and times are customizable.

10   Findme

Find-me function is customizable depending on user's requirement, and it's not supported by all RC demos.

The user can press the "Findme" button on the paired Dongle to trigger the find-me function (if supported).

During find-me process, the RC buzzer will keep beeping until either one of the following events happen:

- The user presses the "Findme" button on the Dongle again to exit Find-me function;
- The user presses any button on the RC.

11   Couch Time

Couch time is customizable depending on user's requirement, and it's not supported by all RC demos.

This feature is used to save power for RC when some button is pressed by mistake and held for a long time.

- The RC will only transmit one packet if a non-repeatable button is pressed and held.
- However, if a repeatable button is pressed and held, it will keep transmitting packets for up to 60 seconds after which the RC will stop transmitting packet until the pressed button is released.

12   Air Mouse

Air mouse function is customizable depending on user's requirement, and it's not supported by all RC demos.

The air mouse feature allows the user to move on-screen cursor by moving and turning the RC.

Long press specific button (e.g. "Set" button) for 3 seconds (configurable) on the RC to enter the air mouse mode (if supported). In this mode, the cursor on screen can be moved by moving the RC in the air, and can simulate mouse button press by rocking the RC.

In air-mouse mode, the RC can exit the air mouse mode under either one of the two conditions:

-    The specified air mouse button (e.g. "Set") is pressed again; or,

-    The RC has no movement for 30 seconds (configurable).

13   OTA firmware upgrade

This feature is used to upgrade the RC firmware by using the Telink PC tool (Key Simulator), a burning EVK board (Burning key) and the sample dongle.

The operation is described below:

1. Download new Firmware (FW) into the dongle.

    1)   Connect hardware: Connect the EVK with PC via an USB cable, and connect the dongle with the EVK via USB interface.
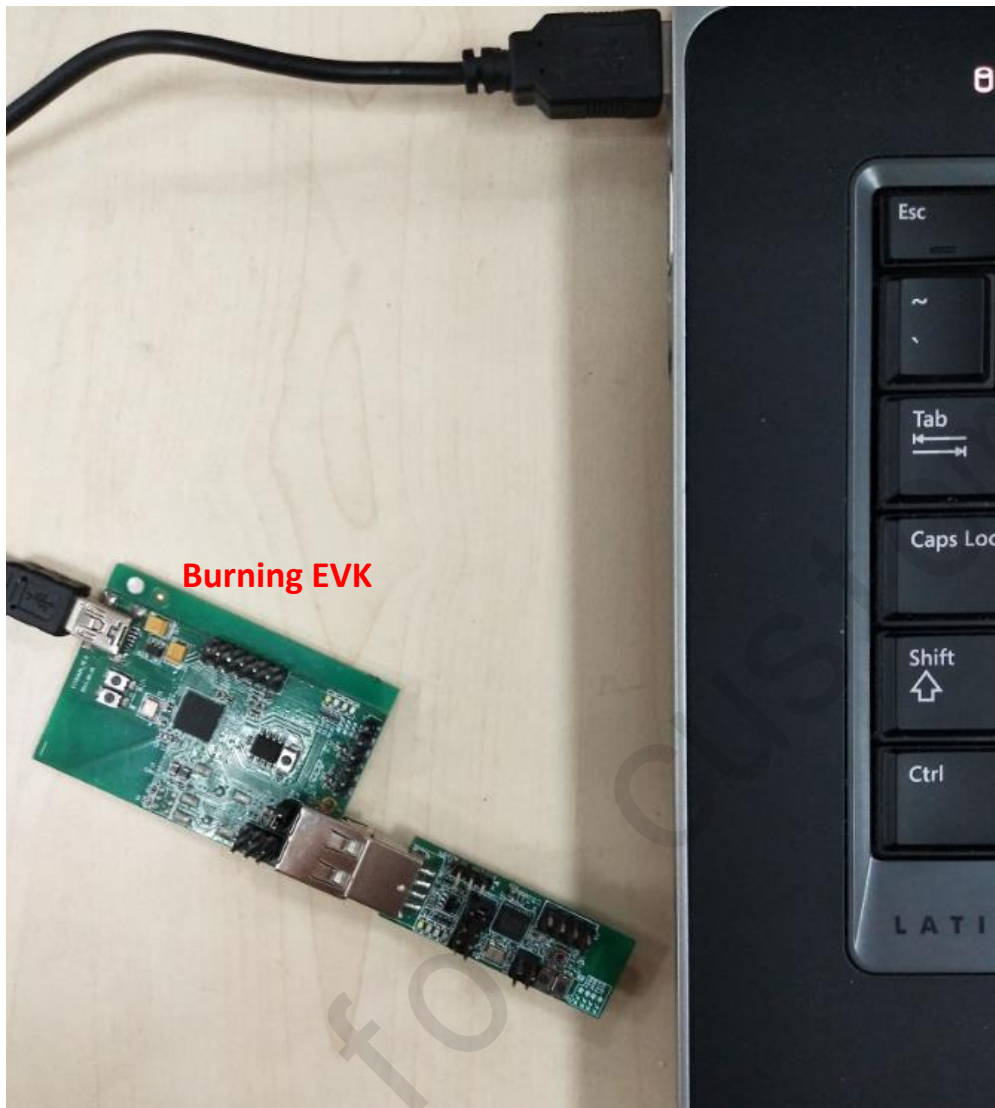
Burning EVK

Figure 3　　Connect EVK, Dongle and PC

2)　Run "KeySimTool" on the PC side. Click the "Download" button on the interface, and select the new FW (e.g. 8232_remote_new.bin) in the "Open" window.
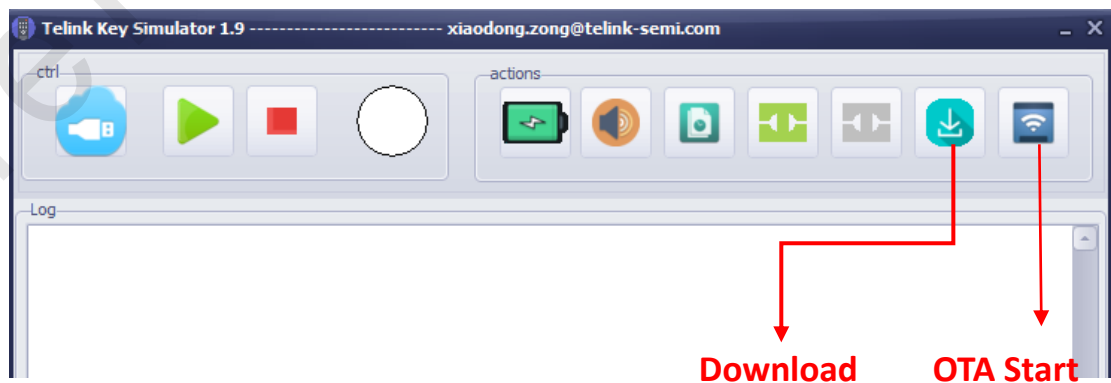

Download　　**OTA Start**

Figure 4   Open new firmware

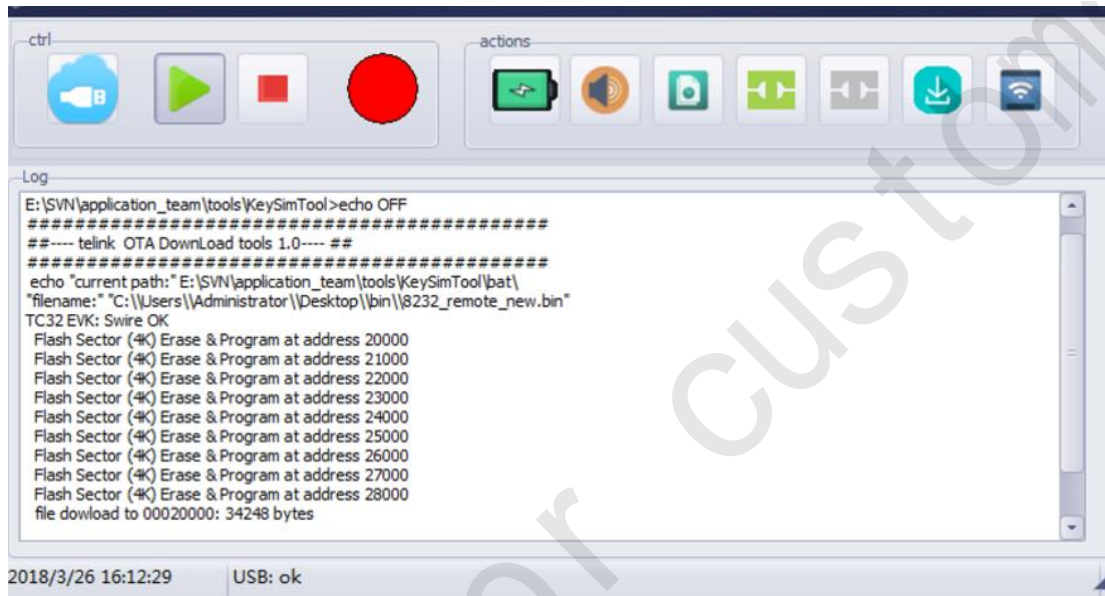3) After the FW is successfully downloaded into the Dongle, the log window of the interface is shown as below:

Figure 5   Successful downloading indication

2. Insert the dongle into PC USB. Make sure that the RC is connected with the dongle in BLE state (i.e. the red light of the dongle is on, and the white light is off), at the same time the button function should be OK.

3. Click the "OTA Start" button 📶 on the "KeySimTool" interface (as shown in Figure 4), the green light of the dongle (as shown in Figure 2) will be turned on to indicate the dongle is in OTA mode.

4. When the green light of the dongle is turned off, the OTA process ends. The OTA result can be checked in the log window of the "KeySimTool" interface.

Figure 6 indicates successful OTA FW upgrade.
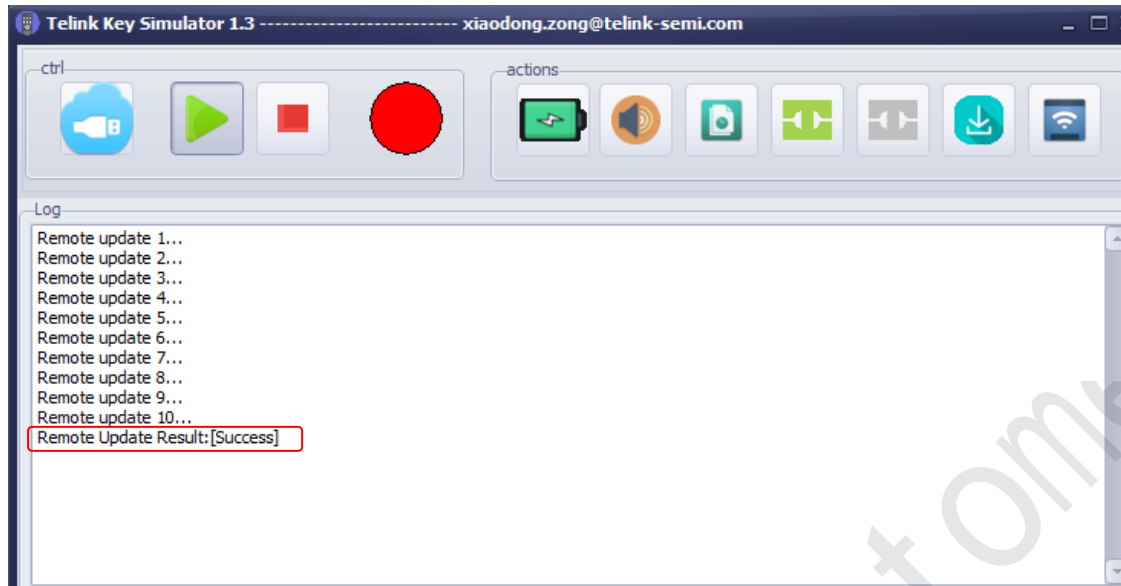
Figure 6   OTA success

Figure 7 indicates OTA timeout.

Figure 7   OTA timeout
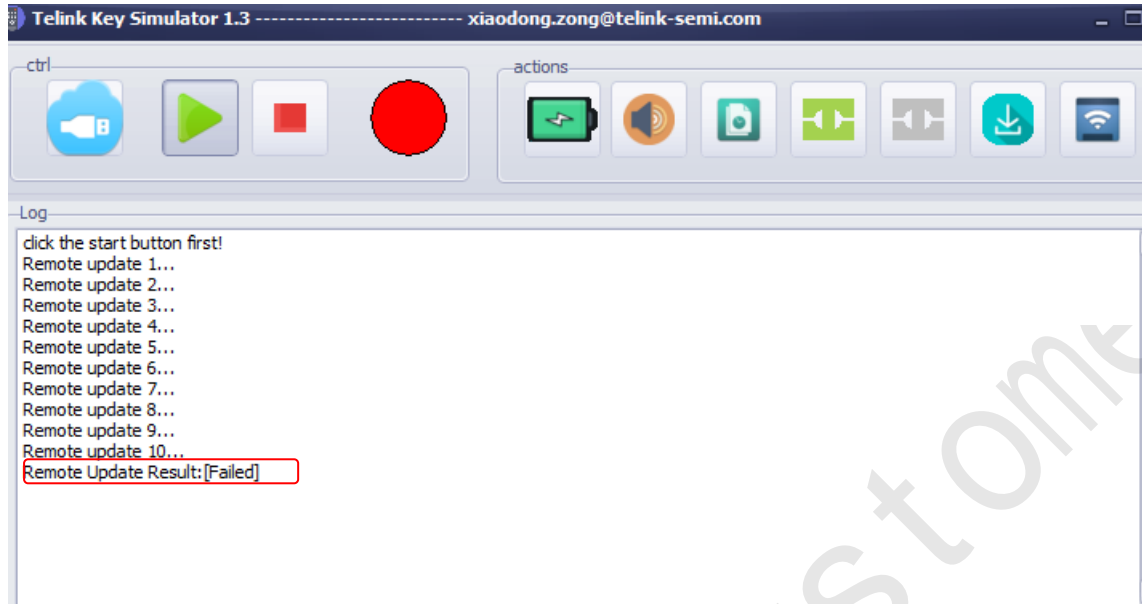
Figure 8 indicates the OTA process fails.

Figure 8   OTA failure

In the case of OTA failure or timeout, user should power cycle the RC and the dongle, then repeat steps 2~3 above to restart OTA process.