

REALTEK

RTL8723BS

Combo NGFF1216 User's Manual

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USING THIS DOCUMENT

This document is intended for the software engineer’s reference and provides detailed programming information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide. In that event, please contact your Realtek representative for additional information that may help in the development process.

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1. General Description

1.1. RTL8723BS

The Realtek RTL8723BS is a highly integrated single-chip 802.11n Wireless LAN (WLAN) SDIO network interface controller with integrated Bluetooth 2.1/3.0/4.0 USB interface controller. It combines a WLAN MAC, a 1T1R capable WLAN baseband, and RF in a single chip. The RTL8723BS provides a complete solution for a high-performance integrated wireless and Bluetooth device.

The integration provides better coordination between 802.11 and Bluetooth, and with sophisticated dynamic power control and packet traffic arbitration, RTL8723BS is able to provide the best coexistence performance.

RTL8723BS also integrates RF/PA/LNA for both 802.11n and Bluetooth so that the number of external components is reduced to minimum. The 802.11 part supports 150Mbps PHY rate and delivers reliable throughput from an extended distance.

The Bluetooth part supports latest 3.0+HS/4.0+LE operation and provides smooth user experience under all usage scenarios. Optimized RF architecture and baseband algorithms provide superb performance and lowest power consumption.

1.2. Environmental

1.2.1. Operating

Operating Temperature: 0 to 70 °C
 Relative Humidity: 5-90% (non-condensing)

1.2.2. Storage

Temperature: -55 to 125 °C
 Relevant Humidity: 5-95% (non-condensing)

1.3. Functional Specifications

Table 1. Functional Specifications

Standards	WiFi: IEEE 802.11b, IEEE 802.11g, Draft IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i BT: BT v3.0, v4.0
Bus Interface	WiFi: SDIO BT: UART
Form Factor	NGFF1216
Data Rate	802.11b: 11, 5.5, 2, 1 Mbps;

	<p>802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps</p> <p>802.11n: MCS 0 to 7 for HT20MHz; MCS 0 to 7 for HT40MHz</p> <p>BT: 1/2/3 Mbps</p>
Media Access Control	<p>WiFi: CSMA/CA with ACK</p> <p>WiFi + BT: AFH, Time Division</p>
Modulation Techniques	<p>802.11b: CCK, DQPSK, DBPSK</p> <p>802.11g: 64 QAM, 16 QAM, QPSK, BPSK</p> <p>802.11n: BPSK, QPSK, 16-QAM, 64-QAM</p> <p>BT: GFSK, $\pi/4$ DQPSK, 8DPSK</p>
Network Architecture	<p>WiFi: Ad-hoc mode (Peer-to-Peer) Infrastructure mode</p>
Operating Channel	<p>WiFi 2.4GHz: 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 13: (Ch. 1-14) – Japan</p> <p>BT 2.4GHz: Ch. 0 ~78</p>
Frequency Range	2.400GHz ~ 2.4835 GHz
Security	<p>WiFi : WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11x, IEEE 802.11i</p> <p>BT: Simple Paring</p>
Operating Voltage	3.3 V \pm 9% I/O supply voltage

1.4. Warning

1.4.1 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2P.

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: TX2-RTL8723BS ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.4.2 Industry Canada Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- 1) this device may not cause interference and
- 2) this device must accept any interference, including interference that may cause undesired operation of the device

French translation:

Ce dispositif est conforme aux CNR d'IndustrieCanada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

This device has been designed to operate with an antenna having a maximum gain of 3.5dBi.

Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the EIRP is not more than required for successful communication.

French translation:

Ce dispositif a été conçu pour fonctionner avec une antenne ayant un gain maximum de 3.5 dBi. Une antenne à gain plus élevé est strictement interdite par les règlements d'Industrie Canada. L'impédance

d'antenne requise est de 50 ohms.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

French translation:

NOTE IMPORTANTE: (Pour l'utilisation de dispositifs mobiles)

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.

Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionner en association avec une autre antenne ou transmetteur.

This module is intended for OEM integrator. The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX IC : 6317A-RTL8723BS ".

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna List

Brand	Model	Type	Gain	Function
LYNwave	ALA110-222050-30001	Type	3.5dBi	WiFi 2.4GHz, BT BR/EDR/LE
Brand	Model	Type	Gain	Function
MDLINK	MBMC01551682G	Dipole	2dBi	WiFi 2.4GHz, BT BR/EDR/LE

1.4.3 NCC 警語

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本模組於取得認證後將依規定於模組本體標示審合格籤。

系統廠商應於平台上標示「本產品內含射頻模組： XXXyyyLPDzzzz-x (NCC ID)」字樣。

1.4.4 Japan Statement

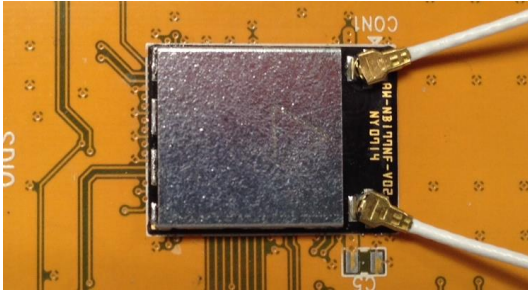
Host system must be labeled with "Contains MIC ID:xxxxxx", MIC ID displayed on label

Installing the Wireless NGFF1216 module Hardware

Step 1. Shut down the computer.

Step 2. Mount the NGFF1216 module on motherboard by soldering.

Step 3. Connect external Wi-Fi/BT antenna to corresponding RF connector.

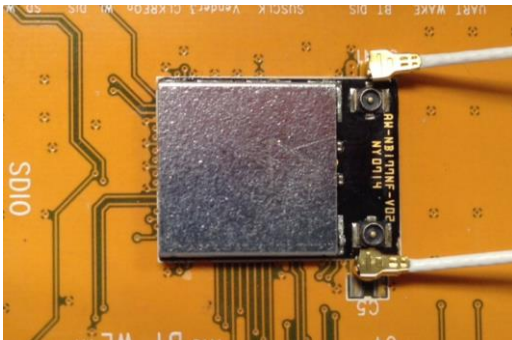


Step 4. Power on the computer.

Un-installing the Wireless NGFF1216 module Hardware

Step 1. Shut down the computer.

Step 2. Remove external Wi-Fi/BT antenna from the wireless NGFF1216 module board.



Step 3. Unmount the NGFF1216 module from motherboard by soldering.

Installing the Wireless SDIO module Software

Before you proceed with the installation, please notice following descriptions.

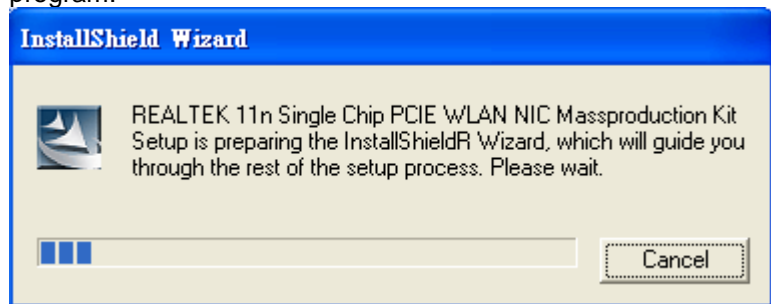
Note1: The following installation was operated under Windows XP.

(Procedures are similar for Windows 98SE/Me/2000.)

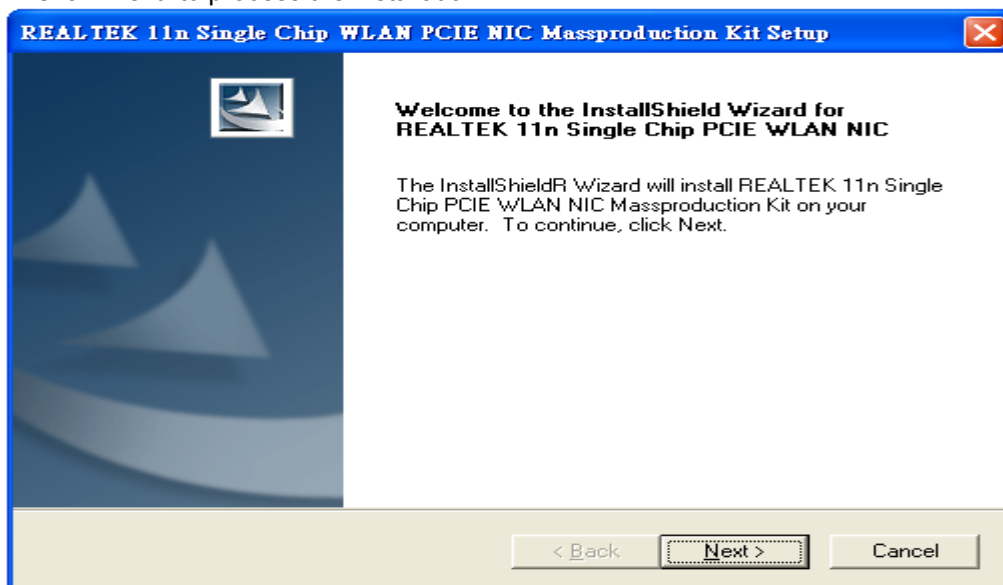
Note2: If you have installed the WLAN driver & utility before, please uninstall the old version first.

If you install the “Realtek11n Single Chip SDIO WLAN NIC Mass production kit” into your laptop computer before installing the software program from the CD.

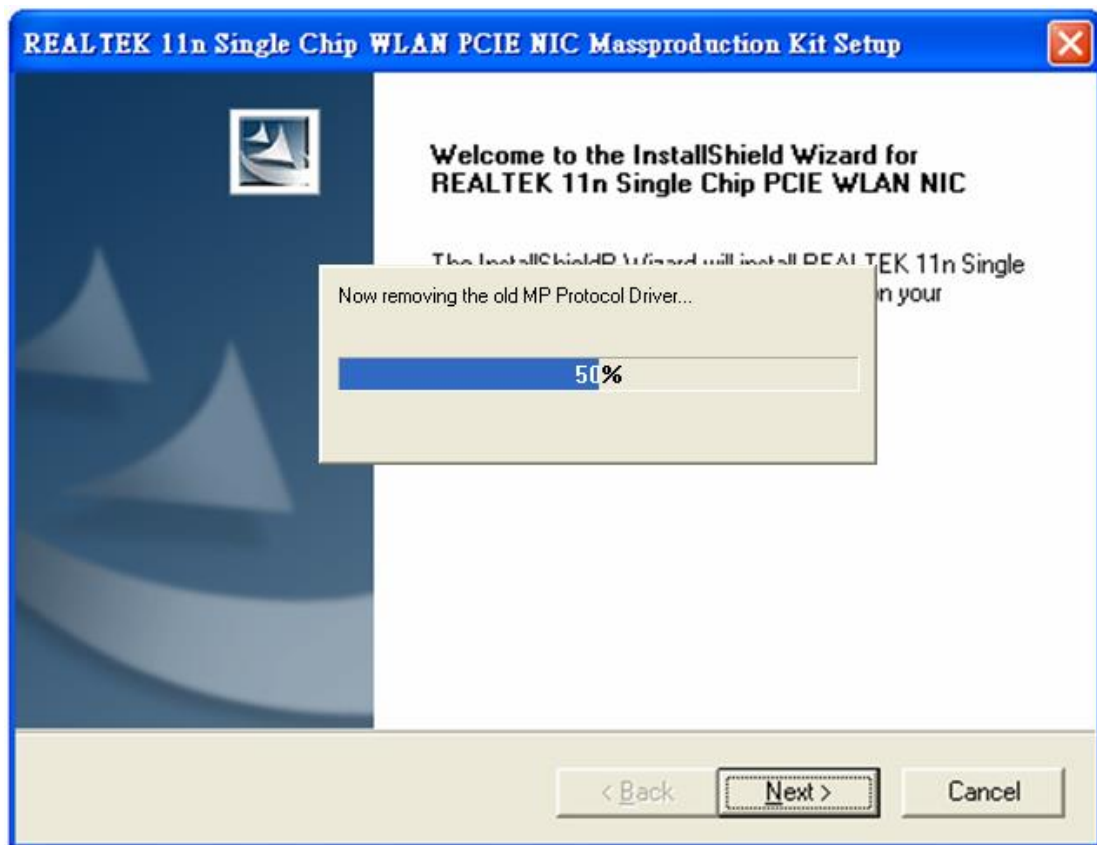
A. Insert the Installation CD to your CD-ROM Drive. Execute the “setup” program.



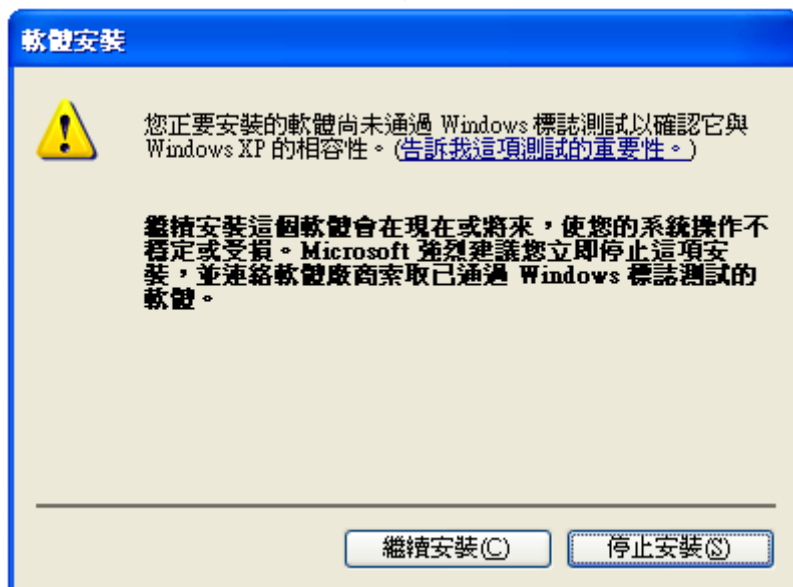
B. Click “Next” to process the installation



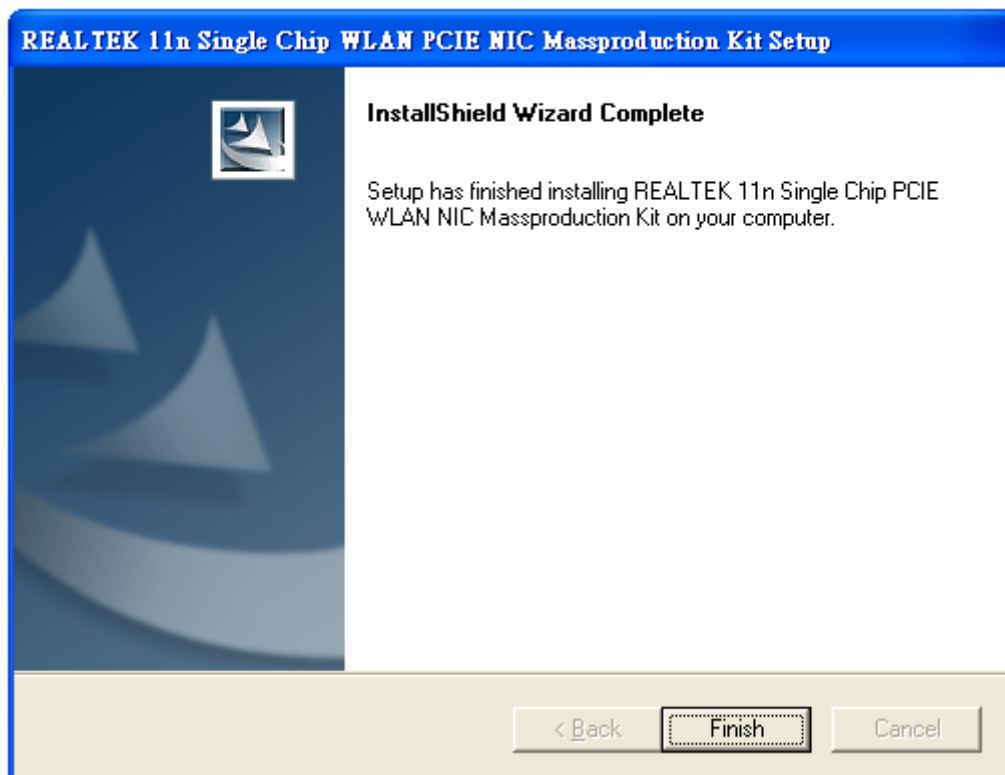
C. The system starts to install the software of the WLAN adapter.



D. The system will automatically detect the card and display “Hardware Installation” screen. Click “繼續安裝” to continue.



E. Please click “Finish” to complete the installation.



Un-installing the Wireless SDIO module Software

If you install Realtek11n Single Chip SDIO WLAN NIC Mass production kit into your laptop computer after installing the software program from the CD.

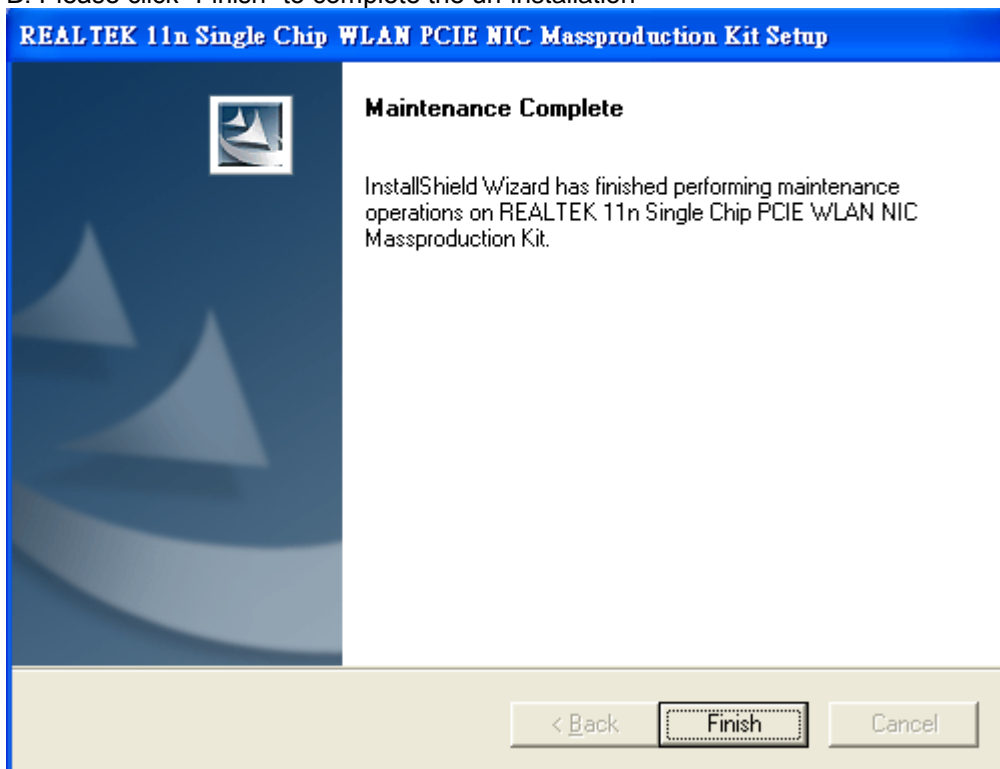
When you install Realtek11n Single Chip WLAN SDIO MINICARD Adapter, the following dialog will be shown.

A. Uninstall the RTL8723BS WLAN Driver from “Start” → “All Programs” → “Realtek11n Single Chip WLAN SDIO NIC Mass production kit” or “Control Panel” → “Change or Remove Programs”.

Please click “Un-install” (or “Change/Remove”) to remove RTL8723BS WLAN driver.

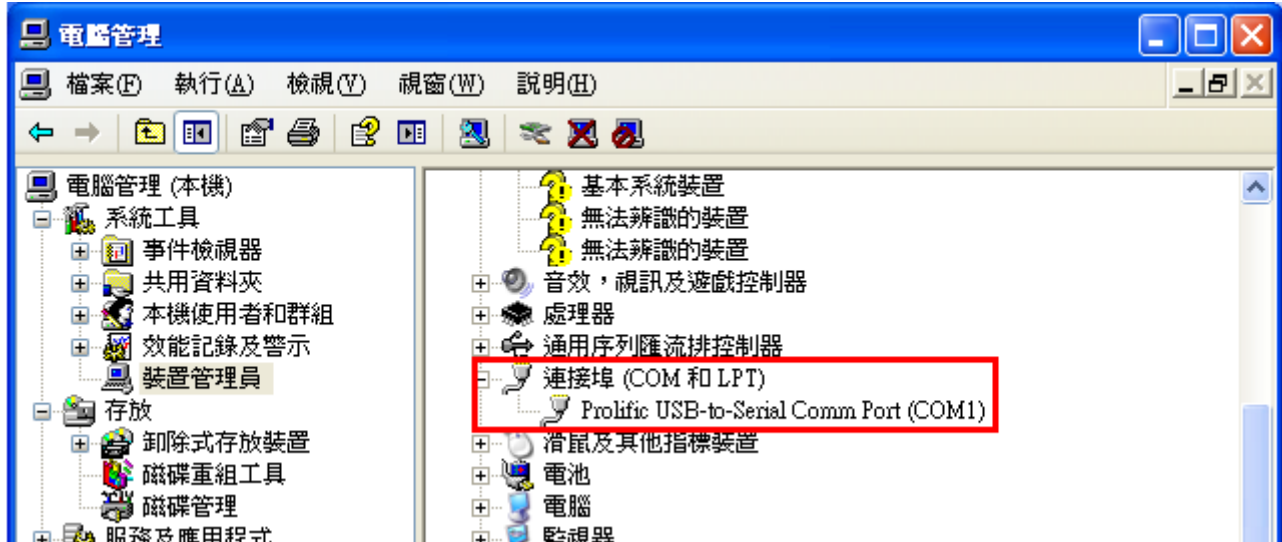


B. Please click “Finish” to complete the un-installation

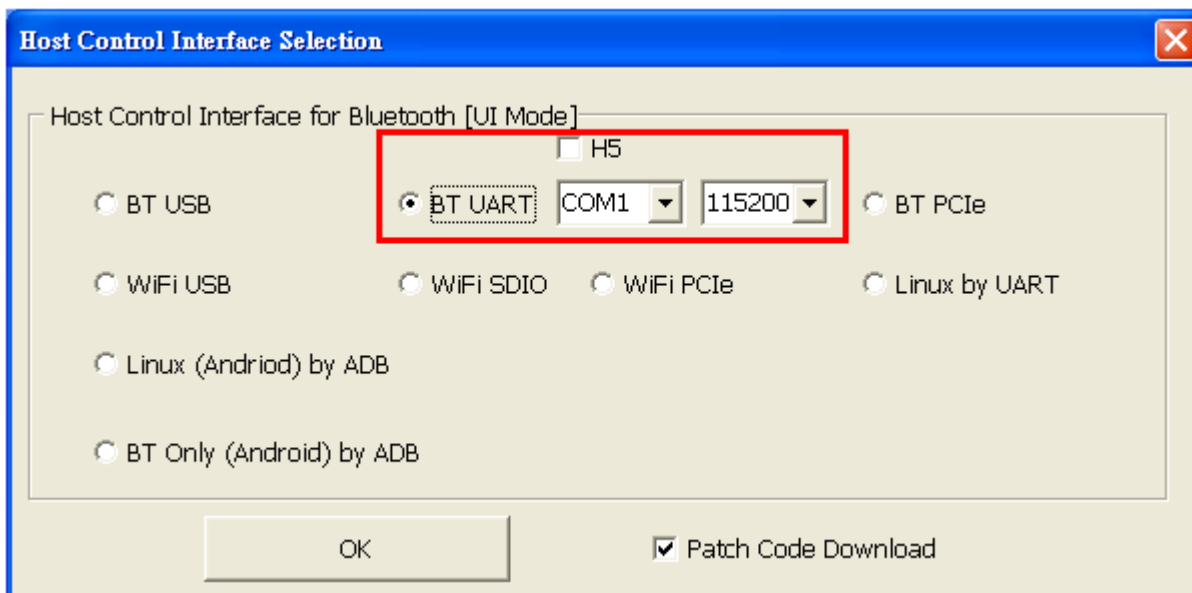


Installing the Bluetooth Module Software

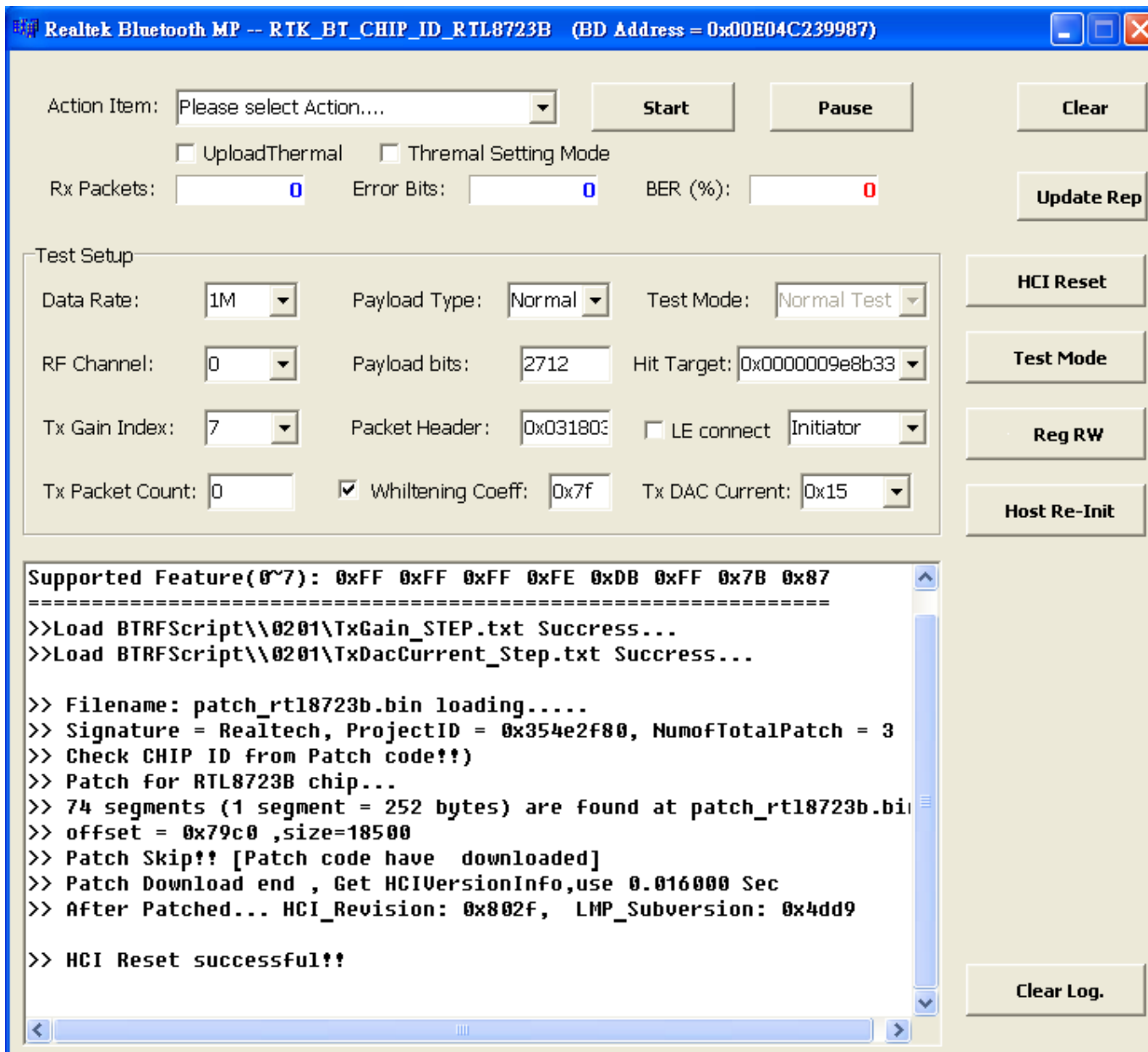
A. Connect the USB-to-RS232 adapter to computer.



B. Choose the right COM port and baud rate setting from the BT test UI, then press the OK button below.



C. The driver will be installed successfully as shown below.



Realtek Bluetooth MP -- RTK_BT_CHIP_ID_RTL8723B (BD Address = 0x00E04C239987)

Action Item: Please select Action.... **Start** **Pause** **Clear**

UploadThermal Thermal Setting Mode

Rx Packets: 0 Error Bits: 0 BER (%): 0 **Update Rep**

Test Setup

Data Rate: 1M Payload Type: Normal Test Mode: Normal Test **HCI Reset**

RF Channel: 0 Payload bits: 2712 Hit Target: 0x0000009e8b33 **Test Mode**

Tx Gain Index: 7 Packet Header: 0x031803 LE connect Initiator **Reg RW**

Tx Packet Count: 0 Whiltening Coeff: 0x7f Tx DAC Current: 0x15 **Host Re-Init**

```
Supported Feature(0~7): 0xFF 0xFF 0xFF 0xFE 0xDB 0xFF 0x7B 0x87
=====
>>Load BTRFScript\0201\TxGain_STEP.txt Success...
>>Load BTRFScript\0201\TxDacCurrent_Step.txt Success...

>> Filename: patch_rt18723b.bin loading.....
>> Signature = Realtech, ProjectID = 0x354e2f80, NumofTotalPatch = 3
>> Check CHIP ID from Patch code!!
>> Patch for RTL8723B chip...
>> 74 segments (1 segment = 252 bytes) are found at patch_rt18723b.bi
>> offset = 0x79c0 ,size=18500
>> Patch Skip!! [Patch code have downloaded]
>> Patch Download end , Get HCIVersionInfo,use 0.016000 Sec
>> After Patched... HCI_Revision: 0x802f, LMP_Subversion: 0x4dd9

>> HCI Reset successful!!
```

Clear Log.

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