FSC-BT2064x User Guide

Release 3.5.0

Table of contents

[中文版]

This guide applies to the **FSC-BT2064x** series Bluetooth dual-mode data transmission application modules, include:

- FSC-BT2064FI

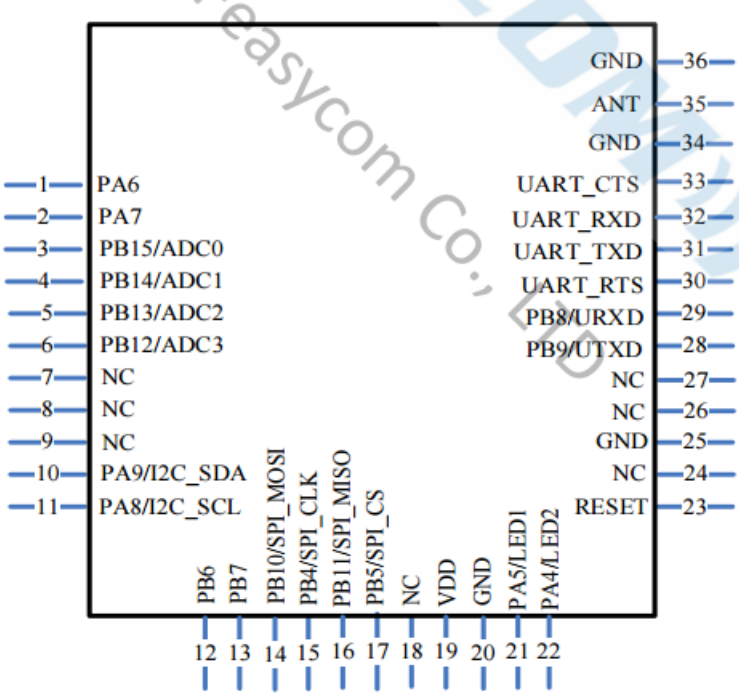
This guide consists of the following parts:

Chapter 1

Hardware Design

[中文版]

1.1 Module Pin Diagram



FSC-BT2064FI PIN Diagram (Top View)

1.2 Pin Description

Pin	Pin Name	Type	Pin Descriptions
31	UART_T	O	Serial Transmitter Data 脚
32	UART_R	I	Serial Receiver Data 脚
33	UART_C	I	UART Clear to Send(no connection request) 脚
30	UART_R	O	UART Request to Send(no connection request) 脚
23	RESET	I	Active-low reset input 位
19	VDD	Powe	Power supply voltage 3.3V, LDO power supply preferred
29	URXD	I	Program Download RXD (Receive Data Pin)
28	UTXD	O	Program Download TXD (Receive Data Pin)
21	PA5/LED	O	Multiplexing: LED;Power-on: Slow blinking of the light;Connected: The light stays on
22	PA4/LED	O	Multiplexing: Connection Status Indication;Disconnected: Low Level;Connected: High Level
35	ANT	ANT	Changing the 0 ohm resistance near the antenna, it is possible to connect a Bluetooth antenna externally

1.3 Hardware Design Note

- In simple test environment, the module can be used for basic testing and operation by simply connecting VDD, GND, UART_RX, and UART_TX.
- If the MCU needs to obtain the connection status of the Bluetooth module, it needs to be connected to the STATUS pin.
- After drawing the schematic diagram, please send it to Feasycom for review to avoid Bluetooth distance not achieving the best effect.

Chapter 2

Functional Description

[中文版]

2.1 Module Default Configuration

Name	FSC-BT2064
LE-Name	FSC-BT2064-LE
Pin Code	0000
Secure Simple Pairing Mode	Off
UART Baudrate	115200/8/N/1

2.2 GPIO Indicators

2.2.1 LED

PIN	Status	Description
PIN21	Slow Blinking	Power-on & Bluetooth Disconnected
PIN21	Steady On	Bluetooth Connected

2.2.2 BT Connection Status

PIN	Status	Description
PIN22	Low Level	Bluetooth Disconnected
PIN22	High Level	Bluetooth Connected

2.3 Work Modes

2.3.1 Throughput Mode

- **Bluetooth Not Connected**: Data received via UART is parsed as AT commands.
- **Bluetooth Connected**: All data received via UART is sent as-is to the remote Bluetooth device.

2.3.2 Command Mode

- **Bluetooth Not Connected**: Data received via UART is parsed as AT commands.
- **Bluetooth Connected**: Data received via UART is still parsed as AT commands. Data must be sent to the remote device using AT commands, e.g., `AT+SPPSEND` or `AT+LESEND`.

2.4 GATT Service

Type	UUID	**Operation**	Description
Service	0xFFF0		Throughput transmission service
Write	0xFFF2	Write,<Write Without Response	APP to Module
Notify	0xFFF1	Notify	Module to APP

Chapter 3

Data Communication Principles

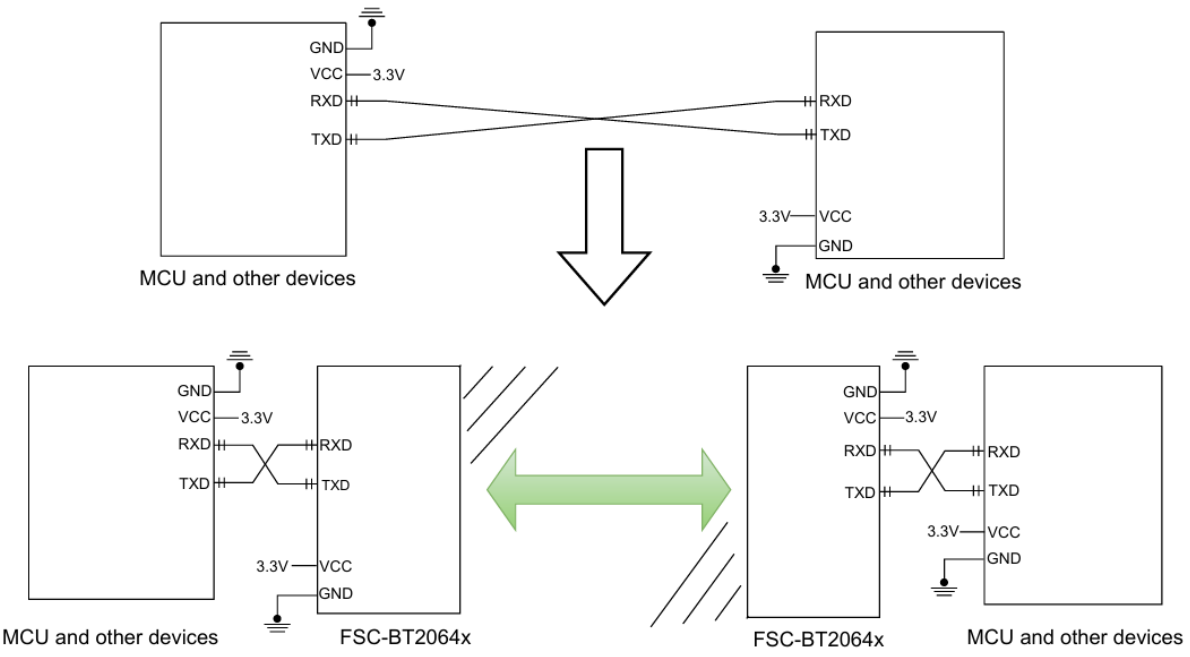
[中文版]

3.1 Communication Principle

FSC-BT2064x series Bluetooth dual-mode data modules enable wireless communication between devices based on the SPP (Serial Port Profile) and BLE (Bluetooth Low Energy) dual-mode protocols.

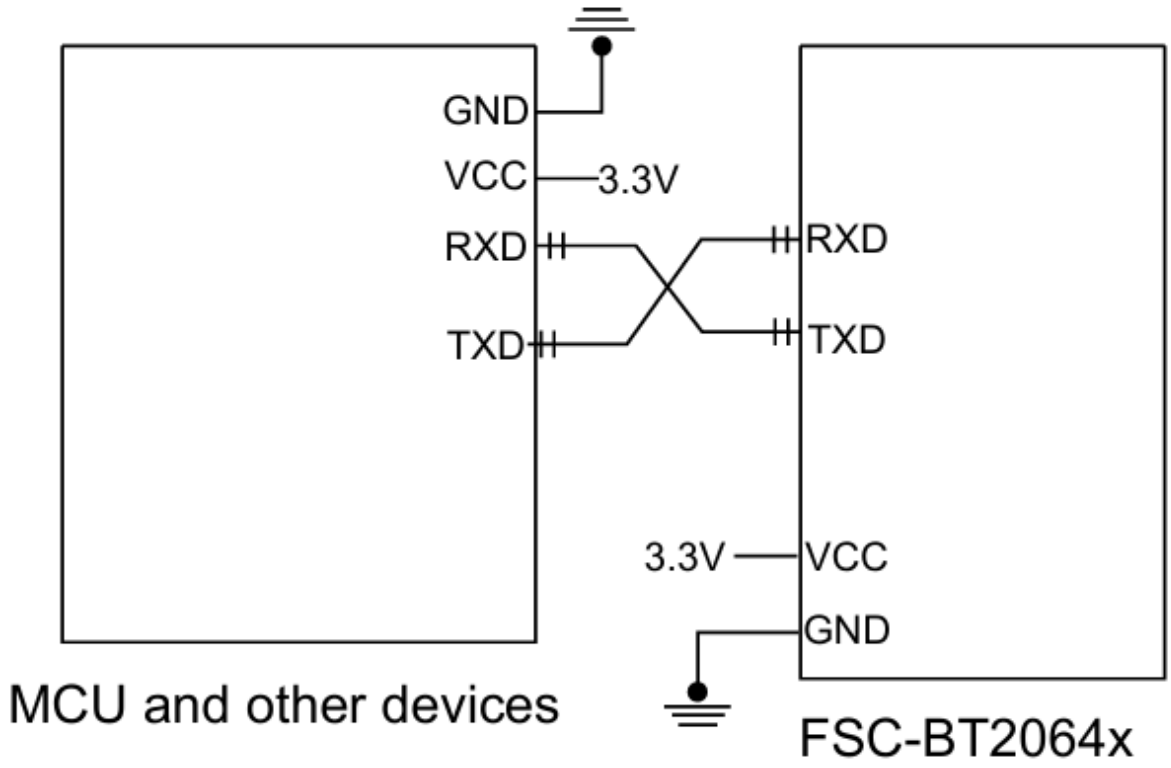
- **SPP Mode**: Emulates traditional serial port communication, establishing a virtual serial link through the RF layer. It supports continuous large data transfers (e.g., file transfer) and is suitable for scenarios like printers.
- **BLE Mode**: Utilizes an event-driven, low-power architecture, defining a "Service-Characteristic" model via the GATT protocol for intermittent small data interactions (e.g., sensor data), ideal for IoT devices.

Both modes share the underlying RF hardware and switch automatically via the protocol stack. The module communicates with the host device (phone/MCU) through the UART interface using AT commands or transparent data transmission to establish connections, exchange data, and manage status.



As shown in the figure, the Bluetooth module replaces the physical cable in full-duplex communication. A device like an MCU (left) sends data via its TXD pin to the Bluetooth module (left). The module's RXD port receives the UART data and automatically transmits it via radio waves over the air to the remote Bluetooth module. The remote Bluetooth module (right) receives the airborne data and delivers it via its TXD pin to the local device, like an MCU (right).

3.2 MCU-to-Module Communication

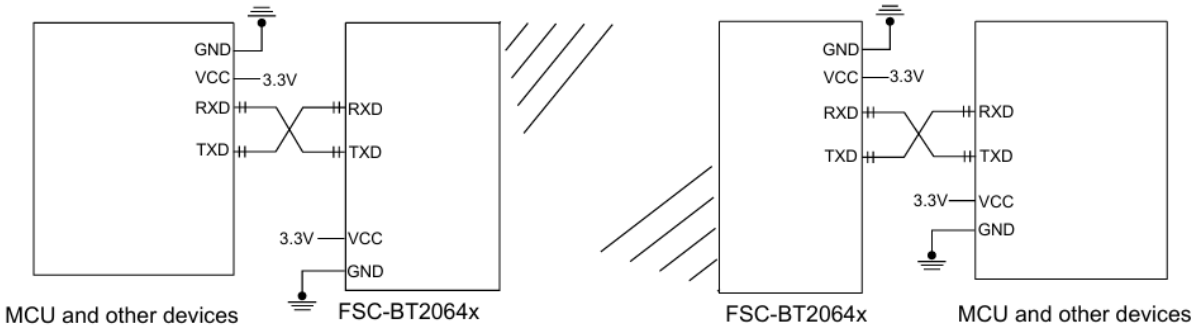


This diagram illustrates the connection between a master MCU (Microcontroller Unit) and an FSC-BT2064x Bluetooth module via cross-connected serial ports, enabling command interaction between the master and the Bluetooth module to support wireless communication functions. It is applicable to IoT devices, remote control, and other scenarios.

1. **Serial Communication Interface**: The master MCU’s transmit pin (MCU_TX) is cross-connected to the Bluetooth module’s receive pin (UART_RX), and the master MCU’s receive pin (MCU_RX) is similarly connected to the Bluetooth module’s transmit pin (UART_TX), forming a bidirectional data transmission channel.
2. **Power and Grounding**: The Bluetooth module is powered by 3.3V through the VDD_3V3 pin and shares a common ground (GND) with the master MCU, ensuring level compatibility and signal stability.

3.3 Module-to-Module Communication

Two FSC-BT2064x Bluetooth modules can establish a Bluetooth connection automatically upon power-up.



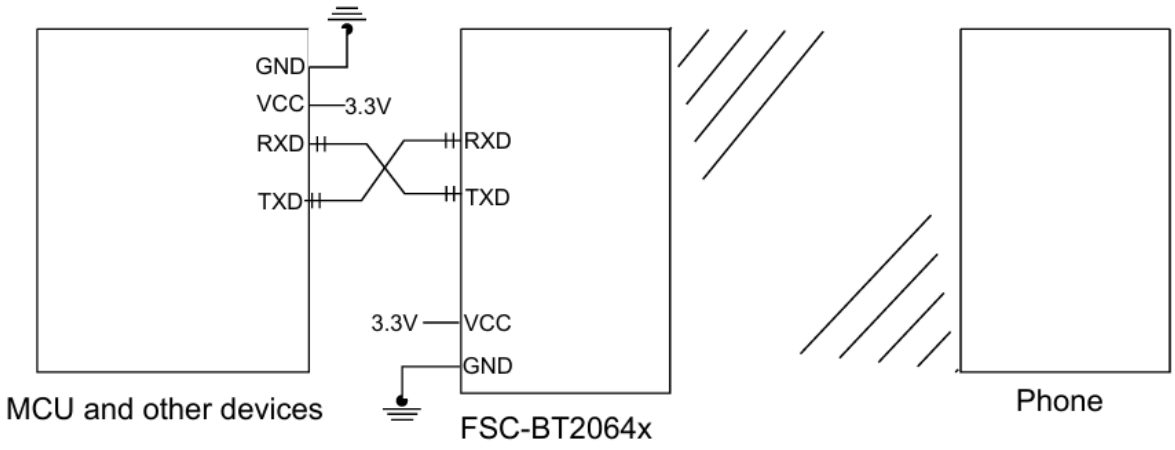
A module can act as a master device to connect to a slave device. The host can send commands to control the module for Bluetooth scanning, connection establishment, data transmission, and connection termination.

3.4 Module-to-Phone Communication

3.4.1 Why do we need to use an app on a mobile phone for Bluetooth connection and communication?

Native phone Bluetooth functionality primarily supports common use cases like audio transfer and file sharing. Some Bluetooth peripheral devices can be connected via the phone's built-in settings (e.g., Bluetooth speakers, headphones, keyboards, mice). However, when a peripheral device, like a module only supporting SPP/GATT protocols, cannot be connected via native phone settings, a specific mobile application, such as the FeasyBlue app, is generally required for connection.

3.4.2 Communication Application



Bluetooth Module Side（FSC-BT2064x）：Continuously transmits broadcast data after power-up；

Mobile Terminal : Can discover the broadcast packets via scanning and initiate a connection request to the module (FSC-BT2064x). Upon successful connection, the Bluetooth module (FSC-BT2064x) will pull the connection status pin HIGH and respond to status indication commands (valid in Command Mode) to notify the host of the successful Bluetooth connection.

Host: Can send data to the remote (Mobile Terminal) Bluetooth via the UART through the Bluetooth module. Conversely, the remote (Mobile Terminal) Bluetooth can also send data back to the host.

Chapter 4

Quick Development Kit

[中文版]

4.1 Datasheet

- FSC-BT2064FI Datasheet

4.2 AT Command Set

- FSC-BT2064x General Dual-mode Data AT Command Set：For FSC-BT2064x General Dual-Mode Data Transmission Application Firmware.
- FSC-BT2064x Printer Multi-link AT Command Set：For FSC-BT2064x Printer Multi-link Application Firmware.

4.3 Serial Port Tool

- Feasycom Serial Port Tool：A serial port communication analysis tool based on Windows PC.

4.4 App&SDK

- FeasyBlue App：Feasycom App & SDK resource supporting Android and iOS, which enables functions such as Bluetooth BLE & SPP data communication test, Feasycom module firmware version reading, parameter configuration, OTA Upgrade and OTA AT commands etc.

4.5 Firmware Upgrade

4.5.1 OTA Upgrade

- Tool： FeasyBlue App
- User Guide : Please refer to FSC-BT2064x - OTA Upgrade.

Chapter 5

Quick Start

[中文版]

5.1 What you need

5.1.1 Required Hardware

- 1 x FSC-BT2064FI Module
- 1 x PC (Windows / Mac)

5.1.2 Software and Setup

- Feasycom Serial Port Tool：A serial port communication analysis tool based on Windows PC.
- Communication Interface：UART
- UART Configuration：115200/8/N/1

5.2 Hardware Access

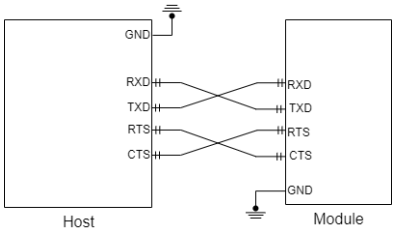
5.2.1 UART Connection

FSC-BT2064FI provides one channels of Universal Asynchronous Receiver/Transmitters(UART) (Full-duplex asynchronous communications). The UART Controller performs a serial-to-parallel conversion on data received from the peripheral and a parallel-to-serial conversion on data transmitted from the CPU.

This is a standard UART interface for communicating with other serial devices. The UART interface provides a simple mechanism for communicating with other serial devices using the RS232 protocol.

When the module is connected to another digital device, UART_RX and UART_TX transfer data between the two devices.

When connecting the module to a host, please make sure to follow：

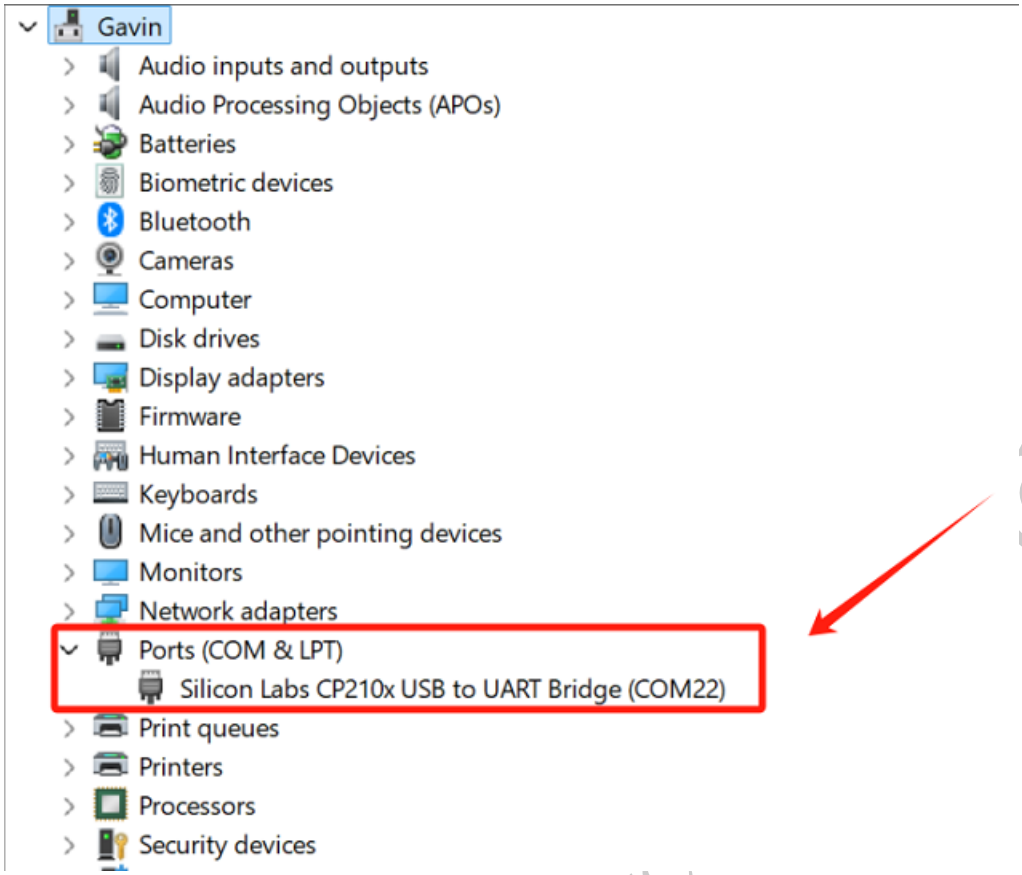


UART Connection

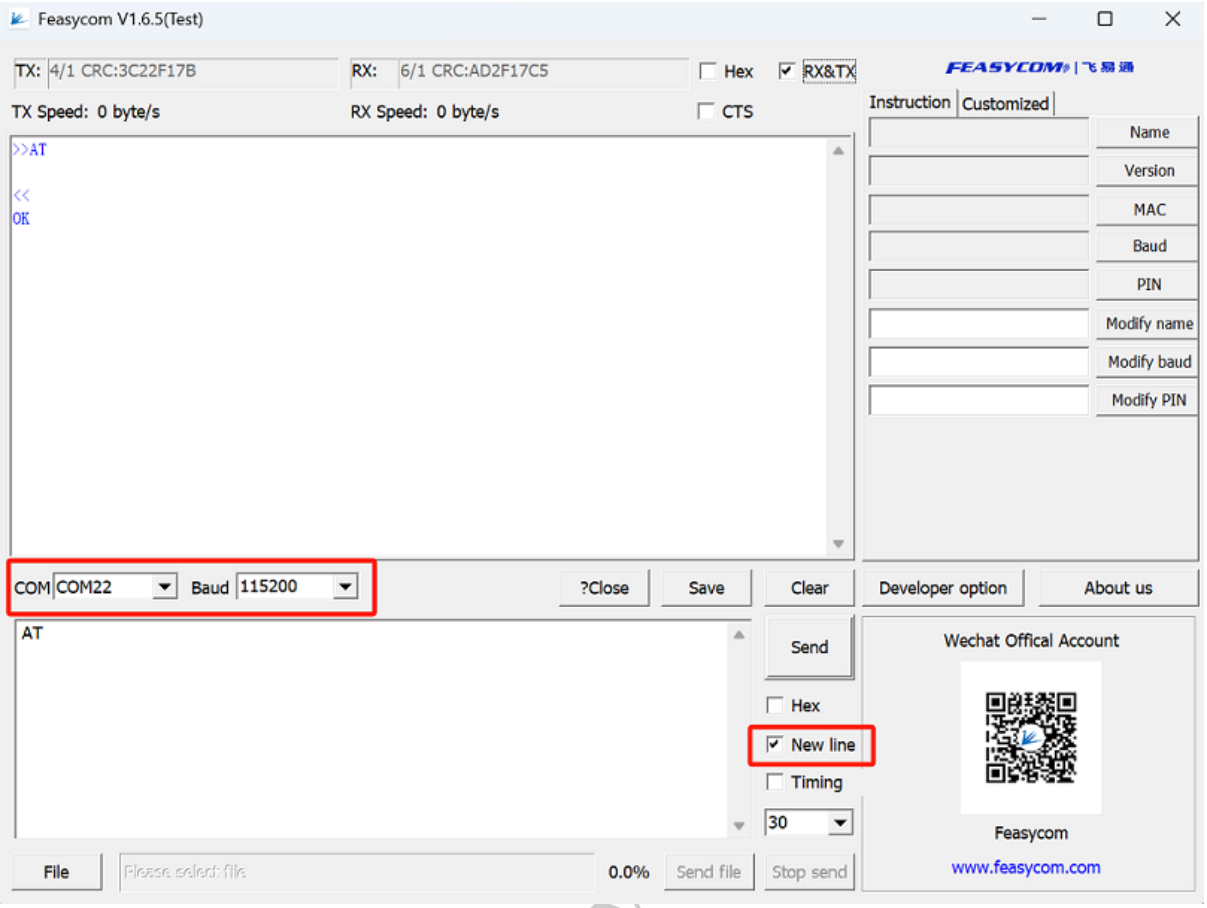
5.3 Communication Test

5.3.1 Module-to-PC

1.On the premise of ensuring compliance with the aforementioned **UART connection** requirements, set up the hardware testing environment with the PC. Upon completion, the PC will automatically recognize the device and virtualize a COM port.



2.Run the Feasycom Serial Port Tool on the PC, set the correct **COM** and **Baud**, and check the **New Line**.



5.3.2 UART Communication Test

The following lists a few basic general AT command test examples.

For more commands, please refer to FSC-BT2064FI General Dual-mode Data AT Command Set.

AT - UART Communication Test

Command	**AT\r\n**
Response	**\r\nOK\r\n**
Description	Test the UART communication between HOST and Module after power on, baudrate changed, etc.

Example:

```
Send:     <<AT\r\n
Response: >>r\nOK\r\n                  //Successfully connected.
```

AT+NAME - Read/Write Local BR/EDR Name

Example: Read BR/EDR Name

```
Send:     <<AT+NAME\r\n
Response: >>\r\n+NAME=FSC-BT2064-xxxx\r\n   //Example, please refer␣
↪to the actual reading
Response: >>\r\nOK\r\n
```

AT+LENAME - Read/Write Local BLE Name

Example: Read Local BLE Name

```
Send:     <<AT+LENAME\r\n
Response: >>\r\n+NAME=FSC-BT2064-LExxxx\r\n   //Example, please␣
↪refer to the actual reading
Response: >>\r\nOK\r\n
```

AT+VER - Read Current Firmware Version

Example: Read Current Firmware Version

```
Send:     <<AT+VER\r\n
Response: >>\r\n+VER=1.0.0,FSC-BT2064\r\n    //Example, please refer␣
↪to the actual reading
Response: >>\r\nOK\r\n
```

Chapter 6

Development Examples

[中文版]

6.1 Data Throughput Mode Application

6.1.1 What is Throughput Mode?

FSC-BT2064x series dual-mode Bluetooth data transmission modules have two data transmission modes: **Throughput Mode** and **Command Mode**.

The generic data throughput firmware for the FSC-BT2064x series modules default to throughput mode. To switch modes, refer to the FSC-BT2064x General Dual-Mode Data AT Command Set and use the **AT+TPMODE** command.

The operation and differences between the two modes are as follows:

- **Throughput Mode**:

Bluetooth Not Connected: Data received via UART is parsed as AT commands.

Bluetooth Connected: All data received via UART is sent as-is to the remote Bluetooth device. It does not contain any data headers or framing and does not require AT commands to send data.

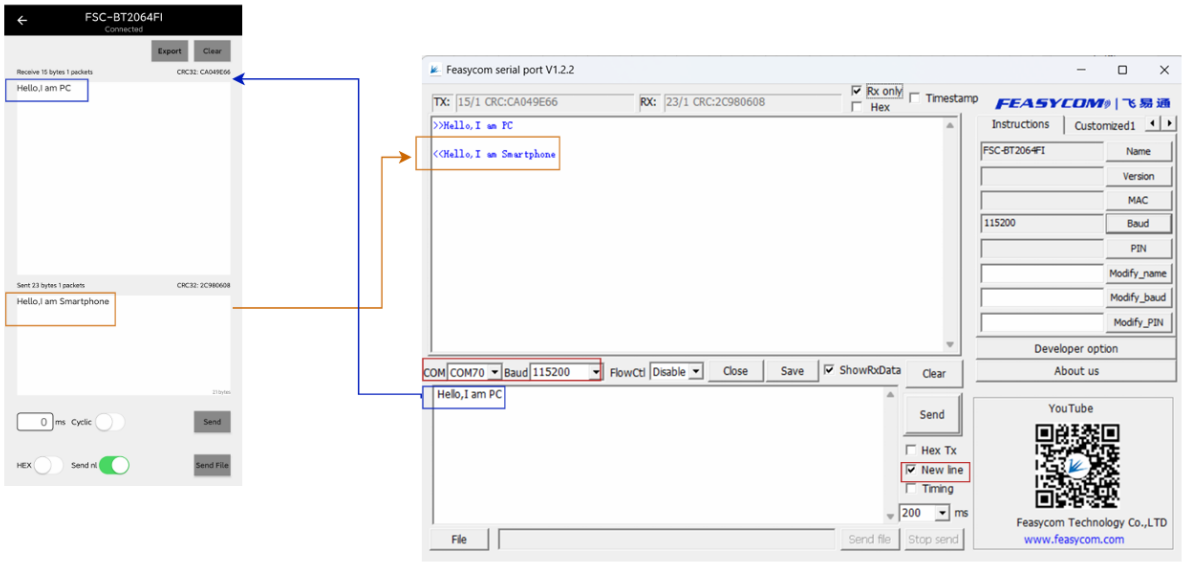
- **Command Mode**:

Bluetooth Not Connected: Data received via UART is parsed as AT commands.

Bluetooth Connected: Data received via UART is still parsed as AT commands. It will contain specific response indication headers and framing. Data must be sent to the remote device using AT commands, such as **AT+SPPSEND** or **AT+LESEND** .

6.1.2 Module to Phone Application

1. **Module** : After power-on, the module will continuously send broadcast packet data.
2. **Phone** : Open the FeasyBlue APP , scan for nearby Bluetooth device advertisements, find the target Bluetooth module, and establish a connection.
3. **Connection Success** : After successful connection, the status pin of the module will pull up the level, indicating that the connection has been established.
4. **Data Transmission** : After successful connection, in the througput mode, the module will automatically transmit the serial port data it receives to the remote end (mobile phone side) via air.



6.1.3 Module to Module Application

Demonstration of SPP communication and data throughput transmission between an FSC-BT2064x and an FSC-BT9101AI Bluetooth module, as follows:

1.Scan for nearby SPP devices

FSC-BT2064x scans for nearby Bluetooth SPP devices, as follows:

```
Send:     <<AT+SCAN=1                    //Scan for nearby Bluetooth SPP devices
Response: >>OK
Response: >>+SCAN={                       // Scan started
Response: >>+SCAN=1,2,DC0D30500762,-62,10,FSC-BW256B
```

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```
Response: >>+SCAN=2,2,DC0D3000012F,-45,10,FSC-BT9101
Response: >>+SCAN=3,2,DC0D30402073,-48,16,iMin TF2-34 2073
Response: >>+SCAN=4,2,A0B339DB5208,-66,10,QUZHENGWEI
Response: >>+SCAN=5,2,DC0D300000CC,-79,17,a12234567890-00CC
Response: >>+SCAN=6,2,DC0D304029E0,-63,10,FSC-BT9104
Response: >>+SCAN=7,2,C02E25D07080,-62,7,OPPO K3
Response: >>+SCAN=8,2,1418C3B28AC1,-58,15,DESKTOP-U13VRNN
Response: >>+SCAN=}                    // Scan ended
```

2.Establish SPP connection request

FSC-BT2064x establishes an SPP connection with the FSC-BT9101AI using the AT+SPPCONN command, as follows:

```
Send:     <<AT+SPPCONN=DC0D3000044F      //Initiate an SPP␣
↪connection request to the remote FSC-BT9101
Response: >>OK
```

3.SPP Connected

In throughput mode, after a successful Bluetooth connection, the UART will not receive event response indicators. The connection status can be determined by the level state of the status pin (e.g., Pin 22) on the FSC-BT2064x, as follows:

High Level (H): Indicates Bluetooth is successfully connected.

Low Level (L): Indicates Bluetooth is not connected or the connection has been disconnected.

4.Send data

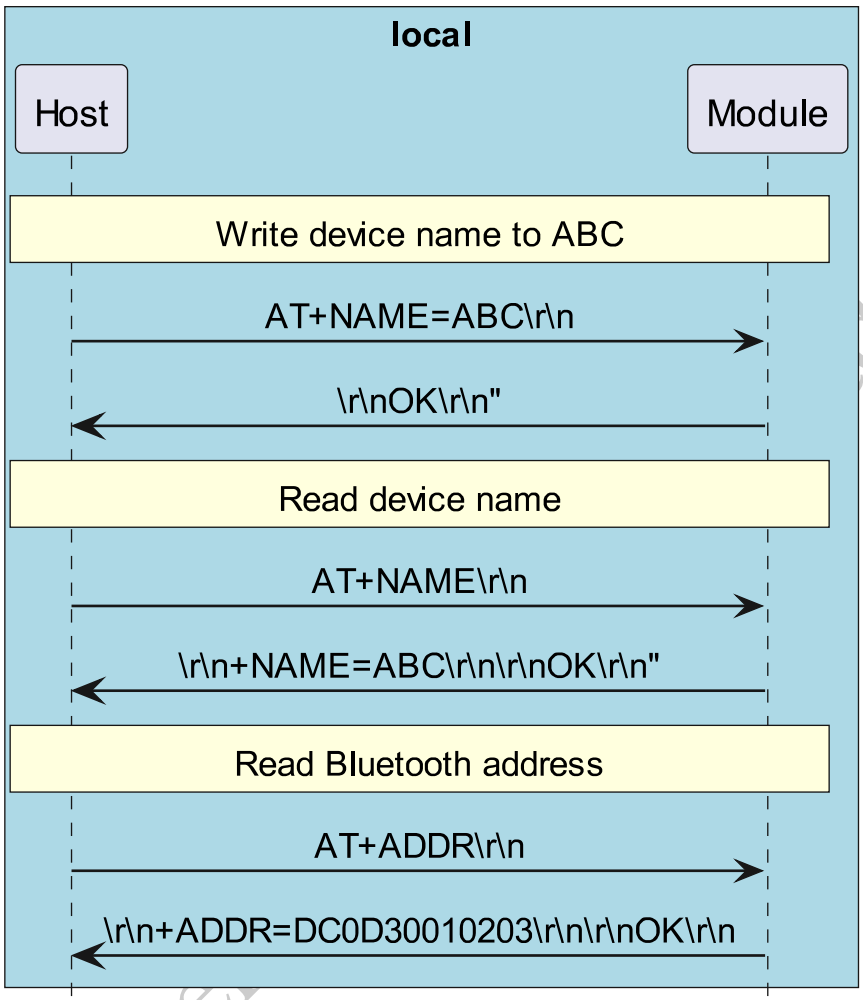
Throughput mode is enabled by default in the generic data transmission firmware. After SPP connected, data can be sent directly without using AT commands

6.2 Read/Write Module Default Parameters

When Bluetooth is not connected, the module parses UART data as AT commands. The host can query and modify the module’s default parameters. As follow:

1. Write the device name to ABC

2. Read the device name
3. Read the Bluetooth address

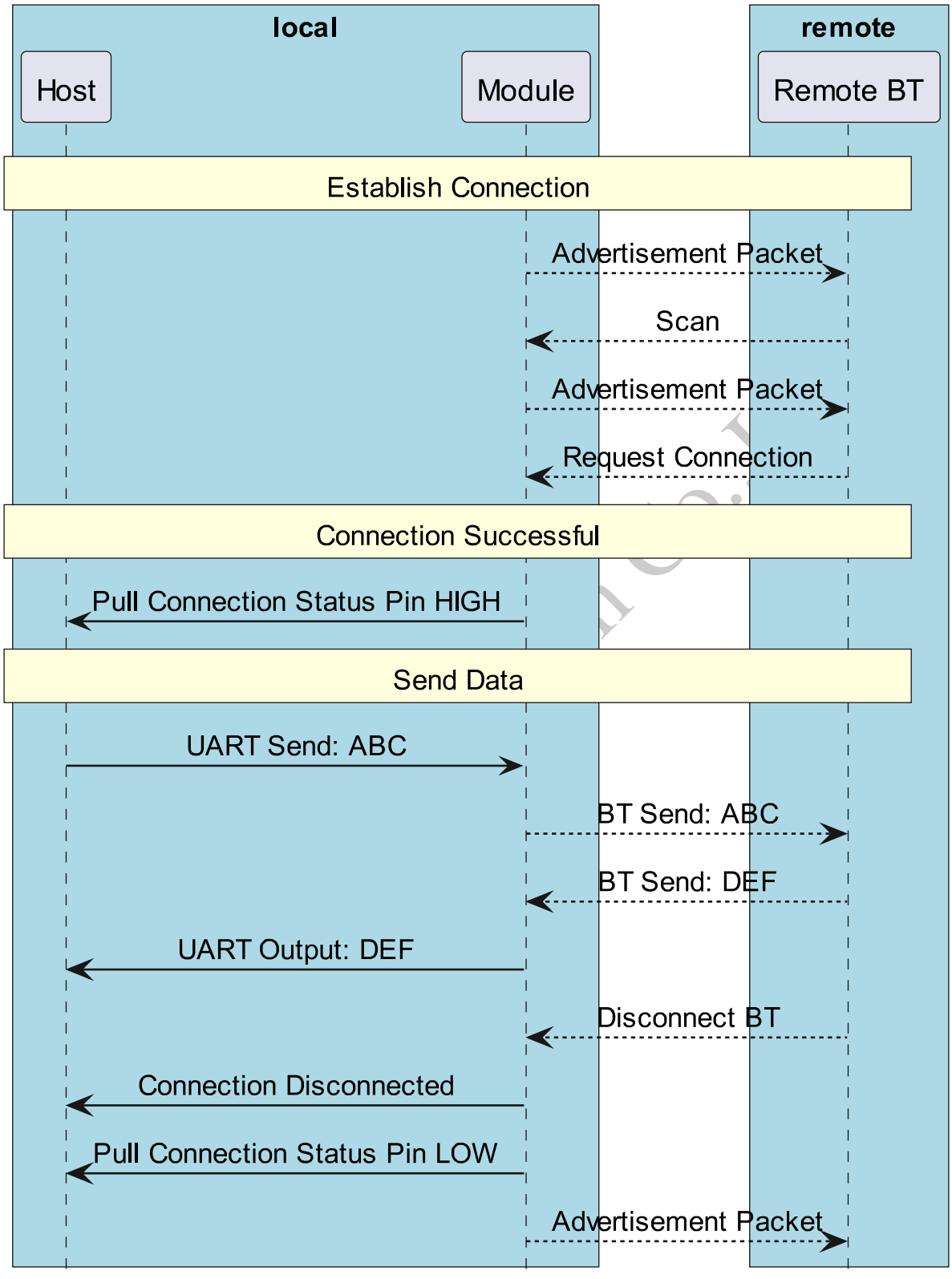


6.3 Data Transmission Flow

Upon power-up, the module continuously transmits advertisement data. A remote Bluetooth device (e.g., phone) can discover these advertisement packets via scanning and initiate a connection request to the module.

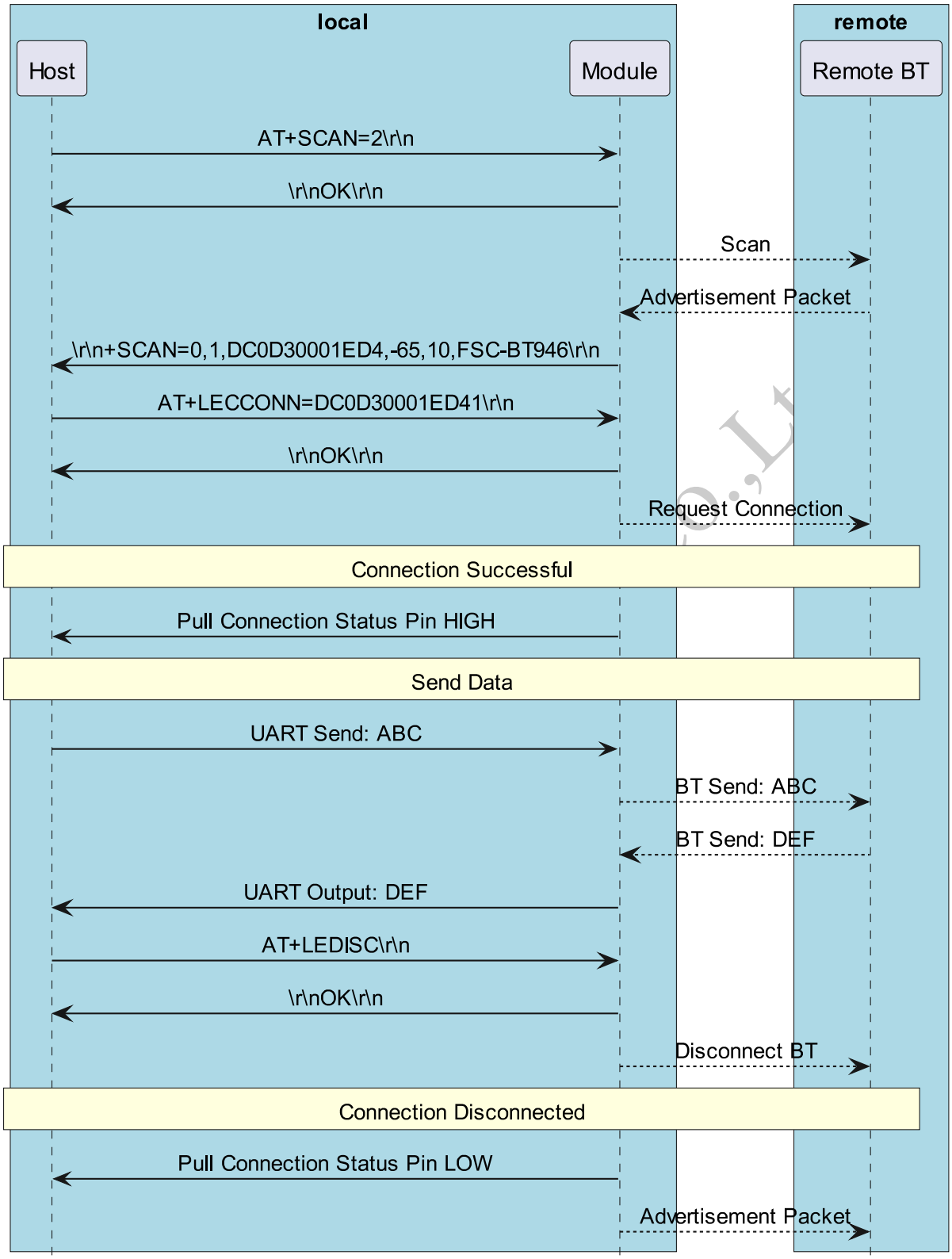
Upon successful connection, the module pulls its connection status pin HIGH to notify the host of the successful Bluetooth connection.

The host can send data to the remote Bluetooth device via the Bluetooth module, and the remote Bluetooth device can also send data to the host.



6.4 Module Acts as Master to Connect to Remote Device

The module can act as a master device to connect to a slave device. The host can send commands to control the module to perform scanning, connection, and disconnection.


local
remote
Host
Module
Remote BT
AT+SCAN=2\r\n
\r\nOK\r\n
Scan
Advertisement Packet
\r\n+SCAN=0,1,DC0D30001ED4,-65,10,FSC-BT946\r\n
AT+LECCONN=DC0D30001ED41\r\n
\r\nOK\r\n
Request Connection
Connection Successful
Pull Connection Status Pin HIGH
Send Data
UART Send: ABC
BT Send: ABC
BT Send: DEF
UART Output: DEF
AT+LEDISC\r\n
\r\nOK\r\n
Disconnect BT
Connection Disconnected
Pull Connection Status Pin LOW
Advertisement Packet

Chapter 7

Firmware Upgrade

[中文版]

The FSC-BT2064x series Bluetooth audio modules have supported over-the-air (OTA) updates, with technical details as follows:

7.1 OTA Upgrade

7.1.1 Tool

- FeasyBlue App (Based on Android & iOS)

7.1.2 User Guide

1.Run the FeasyBlue App, select **Settings - OTA Upgrade** to enter the OTA Upgrade function section. After entering, you will navigate to the device search interface to select the Bluetooth device to be upgraded.

2.Search for and select the Bluetooth device that needs upgrading. After selecting the device, you will enter the **Load Firmware** function interface to load the firmware upgrade file.

3.There are two ways to load the firmware upgrade file:

- **Select Firmware**: Choose to load the firmware upgrade file stored in the mobile phone's local storage (the firmware upgrade file is provided by Feasycom).
- **Get Firmware**: Enter the DFU name to download and import the corresponding firmware upgrade file from the cloud server via the network (the DFU name is provided by Feasycom).

4.After the firmware file is loaded successfully, click the **Start Upgrade** button. The interface will display “Upgrading” and the upgrade progress, indicating that the upgrade mode is activated and the upgrade is in progress.

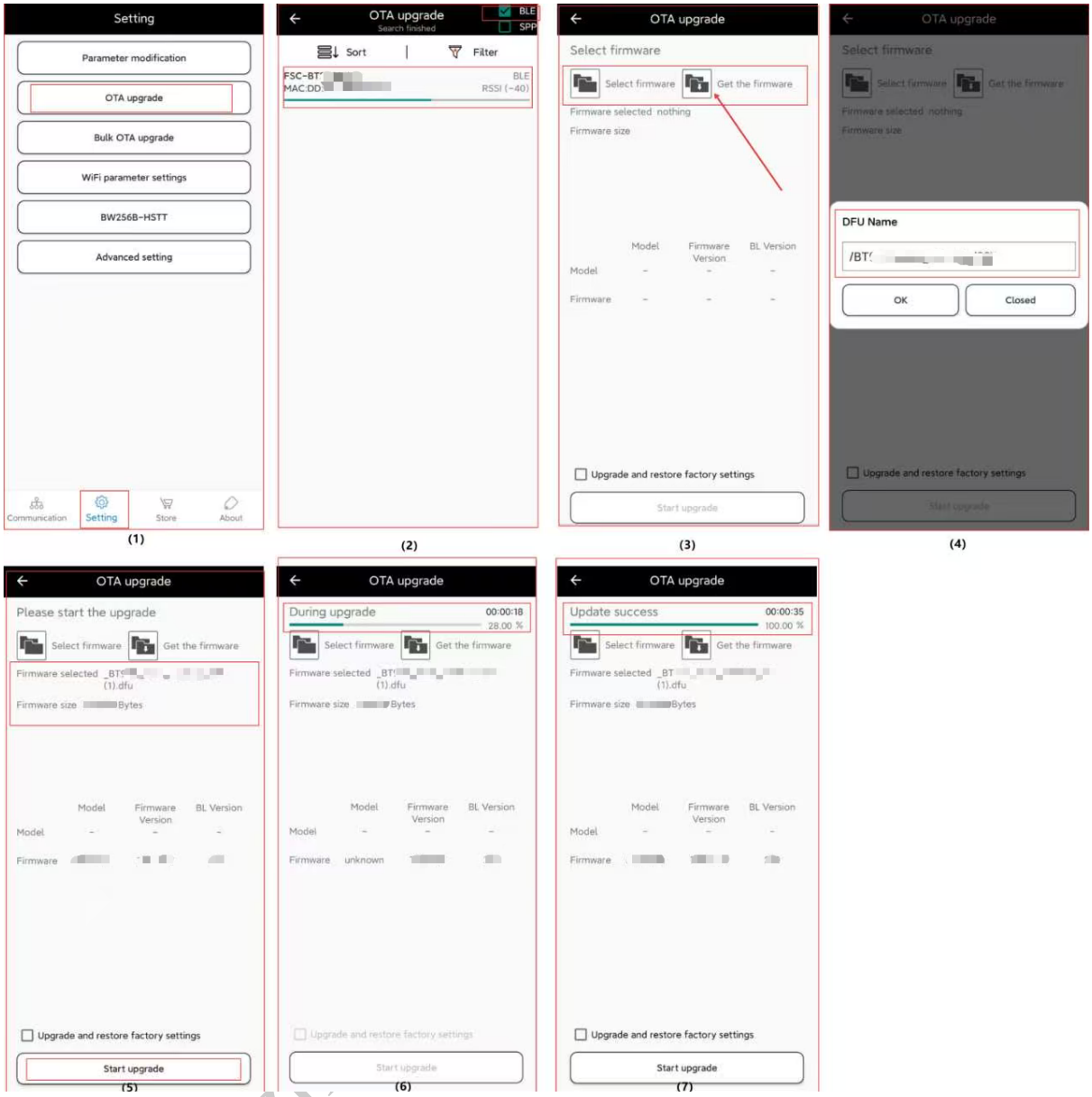
5.Wait for the upgrade progress bar to complete and the interface to display “Upgrade Completed”—the upgrade is then finished.

Warning :

1. When installing and running the FeasyBlue App, please allow the App to access the permissions for **nearby devices**, **location information**, and **media and file access**. Otherwise, you may fail to search for nearby Bluetooth devices and load the firmware upgrade file.
2. If you use the “Obtain Firmware” method (importing the firmware upgrade file by entering the DFU name), note that the mobile phone must be connected to the Internet, and ensure the DFU name is entered correctly (case-sensitive). Otherwise, an error of “network or file error” may occur.
3. Do not disconnect the power during the upgrade process.

7.1.3 Example

Note: The following diagram demonstration is based on Android platform operations. The involved device names, parameters, and firmware DFU names are demonstration examples. Please refer to the actual ones during project operations.


Setting
Parameter modification
OTA upgrade
Bulk OTA upgrade
WiFi parameter settings
BW256B-HSTT
Advanced setting
Communication
Setting
Store
About
(1)
OTA upgrade
Search finished
BLE
SPP
Sort
Filter
BLE
RSSI (-40)
(2)
OTA upgrade
Select firmware
Select firmware
Get the firmware
Firmware selected nothing
Firmware size
Model
Firmware Version
BL Version
Model
Firmware
Upgrade and restore factory settings
Start upgrade
(3)
OTA upgrade
Select firmware
Select firmware
Get the firmware
Firmware selected nothing
Firmware size
DFU Name
OK
Closed
Upgrade and restore factory settings
(4)
OTA upgrade
Please start the upgrade
Select firmware
Get the firmware
Firmware size
Bytes
Model
Firmware Version
BL Version
Model
Firmware
Upgrade and restore factory settings
Start upgrade
(5)
OTA upgrade
During upgrade
00:00:18
28.00 %
Select firmware
Get the firmware
Firmware size
Bytes
Model
Firmware Version
BL Version
Model
Firmware
unknown
Upgrade and restore factory settings
Start upgrade
(6)
OTA upgrade
Update success
00:00:35
100.00 %
Select firmware
Get the firmware
Firmware size
Bytes
Model
Firmware Version
BL Version
Model
Firmware
Upgrade and restore factory settings
Start upgrade
(7)

Chapter 8

FAQs

[中文版]

8.1 1. Why is a dedicated App needed for Bluetooth connection and communication on a phone?

Native phone Bluetooth functionality primarily supports common use cases like audio transfer and file sharing. Some Bluetooth peripheral devices can be connected via the phone's built-in settings (e.g., Bluetooth speakers, headphones, keyboards, mice). However, when a peripheral device, like a module only supporting SPP/GATT protocols, cannot be connected via native phone settings, a specific mobile application, such as the FeasyBlue app, is generally required for connection.

8.2 2. How to get the Bluetooth MAC address on an iOS phone?

Due to security considerations, the iOS system converts the Bluetooth MAC address into a UUID at the underlying level before presenting it to upper-layer applications. Therefore, apps cannot directly obtain the device’s actual MAC address.

The FSC-BT2064x series Bluetooth modules include the MAC address in their broadcasts by default. Apps can retrieve the MAC address from the advertisement packet using the following method.

```
- (void)centralManager:(CBCentralManager *)central
didDiscoverPeripheral:(CBPeripheral *)peripheral
advertisementData:(NSDictionary *)advertisementData RSSI:(NSNumber
*)RSSI
{
    if(![self describeDictonary:advertisementData])
    {
        NSLog(@"is not fsc module");
        return;
    }
}

- (Boolean)describeDictonary: (NSDictionary *) dict
{
    NSArray *keys;
    id key;
    keys = [dict allKeys];
    for(int i = 0; i < [keys count]; i++)
    {
        key = [keys objectAtIndex:i];
        if([key isEqualToString:@"kCBAdvDataManufacturerData"])
        {
            NSData *tempValue = [dict objectForKey:key];
            const Byte *tempByte = [tempValue bytes];
            if([tempValue length] == 6)
            {
                // tempByte Subsequent parameters are the Bluetooth
address
                return true
            }
        }else if([key isEqualToString:@"kCBAdvDataLocalName"])
        {
            //there is name
            //NSString *szName = [dict objectForKey: key];
        }
    }
```

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```
    return false;
}
```

Chapter 9

Contact Information

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Chapter 10

Appendix

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