BCM-LN300-AS

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CONFIDENTIAL INFORMATION

BnCOM Co.,Ltd.

■ Revision History

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1. Introduction

This document defines the communication protocol through UART (serial port) between the "BCM-LN200-AS Module" (hereinafter "BT") and the client's MCU (hereinafter "HOST") connected by UART interface.

1.1 Basic Protocol Rules

Data transmission/reception between HOST and BT is made based on UART (serial port) interface.

- UART(serial port) default settings:
  - Baud rate: 115200 bps
  - Data bit: 8
  - Parity bit: none
  - Stop bit: 1
  - Flow control: RTS/CTS Enable

  The above are default setting values. In case you want to change them, please make a request for modification when writing BT firmware or modify them using the corresponding AT command .

- Communication Direction
  - REQUEST (HOST→BT): Generated from HOST and transmitted to BT.
  - NOTIFY(BT → HOST): A message is generated from BT and delivered to HOST. It informs the basic state of BT.
  - RESPONSE(BT → HOST): A message is generated from BT and delivered to HOST, which is a response to a request.

- Communication Rule
  All protocols consist of a combination of ASCII values, and the protocol command announces the end of the command through Carriage Return (0x0D).

  e.g.) RESPONSE – REQUEST 'request success': "+OK\r"

Command	ERROR					
Command Set	+	O	K	\r		
ASCII Set	0x2B	0x4F	0x4B	0x0D		

1.2 Basic protocol operation

BT transmits the corresponding RESPONSE after receiving a request from HOST. HOST may basically expect a RESPONSE of ″+OK”↲ or ″+ERROR, N”, and may receive a specific RESPONSE corresponding to a request.

2. Bluetooth Low Energy

When BT operates, it operates as BLE Peripheral, and provides the following functions:

2.1. Classification of BLE Service UUIDs

BT provides Data Service for data communication. Each UUID is shown in the table below. Smartphones or other devices can access each service through the following UUID.

Class.	UUID	Property
Data Service (Primary)	0xE4E20000C74011EA87D074F07D000000	N/A
Notification (Characteristic)	0xE4E20001C74011EA87D074F07D000000	Notification
Write No Response (Characteristic)	0xE4E20002C74011EA87D074F07D000000	Write without Response

2.2. BLE Advertising Data

Advertising data transmitted from the factory reset status of BT during BLE operation is as shown in the “Advertising Data Table” below.

″Host” can set the Advertiser manufacture/Service data information through AT command.

- Advertising Data Table

Total 31Byte	**AD Structure 1**	**Length**	0x02	Length of this data
		Type	0x01	Advertising type flag
		AD Data	0x06	LE Flag
	AD Structure 2	**Length**	0x02	Length of this data
		Type	0x0A	BLE TX Power
		AD Data	0x87	0 dBm
	AD Structure 3	**Length**	0x11	Length of this data
		Type	0x09	Complete Local Name
		AD Data BLE Name	0x42	B
			0x43	C
			0x4D	M
			0x2D	-
			0x4C	L
			0x4E	N
			0x32	3
			0x30	0

			0x30	0
			0x2D	-
			0x41	A
			0x53	S
	AD Structure 4	Length	NULL	
		Type	NULL	
		Manufacture Data (User settings Data)	NULL	

3. BT GPIO

A separate GPIO is allocated to notify the status information of BT or control specific functions of BT from HOST.

GPIO	Name	Direction	I/O	Description
PIO.04	Connected State	Output	Low	BLE Device Disconnected.
			High	BLE Device Connected.
PIO.01	Command Mode State	Input	Low	Command Mode (When the other device is connected.)
			High	BLE Data Transfer Mode (when the other device is connected.)
PIO.00	Sleep Wakeup	Input	Both (default : Low)	1. When BT is in an uart off sleep mode through AT command, Uart On. 2. When BT is in a Deep sleep mode through AT command, Device Reset wake up.

e.g.> BT Uart wake up : PIO.00 (default : LOW) -> PIO.00 (High) -> PIO.00 (LOW) = BT Uart Init

4. Summary of Notify Protocols

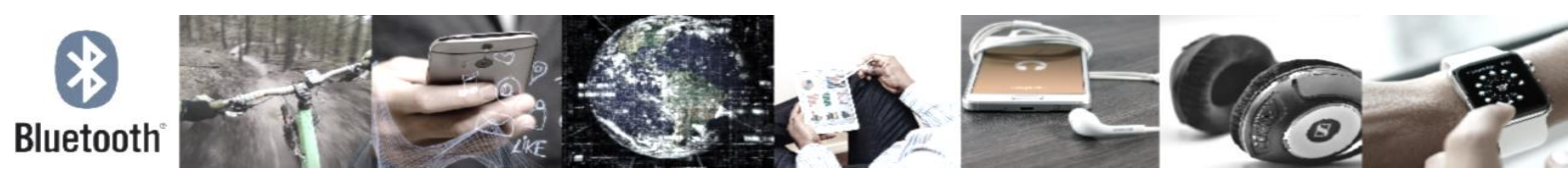
Through a Notify message notifying the status change of BT, HOST can detect the status change of BT in real time.

Command	Description	Remark
+READY\r	Initialization completed with power applied.	
+CONNECTED\r	BT device connects with other device.	
+DISCONNECTED\r	BT device disconnects from the other device.	
+IDLE	BT device goes into standby state.	
+ADVERTISING\r	BT device starts BLE Advertising.	
+COMMAND\r	BT operates in an AT Command state while it is connected to the other device.	
+TRANSFER\r	BT operates in a Data Transfer state while it is connected to the other device.	

5. Summary of General Response Protocols

The response messages notifying the result of processing commands that control various actions of BT are as follows.

Command	Description	비고
+OK\r	Response to a command reception	
+ERROR,1\r	No command received	
+ERROR,2\r	Error in the value of parameters transmitted in a command	
+ERROR,3\r	Error in the number of parameters transmitted a in command	
+ERROR,4\r	The command cannot be processed	
+ERROR,5\r	The command was executed, but the operation was not normal.	



6. Summary of AT Request Command Protocols

As the commands provided by BT may need to be reset after executing them, ensure to use them by referring to the table below.

6.1 Summary of General Commands

Command	Function	Factory Default (Initialization) Setting Value	Need to Reset	Remark
AT	Data transmission and reception test.			
ATZ	Device reset.			
ATO	BLE Data transmission mode setting.			
AT&F	Factory reset device settings			
AT&S	Save device setting information.			
AT+DISCONNECT	Disconnect BLE device.			
AT+VER?	Device firmware version information.	1.0.0		
AT+REMOTEADDR?	Mac address information of a connected device.			
AT+NAME?	Device name information.	BCM-LN300-AS		
AT+NAME=xxx	Set a device name.			
AT+ADVINFO?	BLE Advertiser information.			
AT+ADVERTISING?	BLE Advertiser operation status information.	"+ADVERTISING"		
AT+ADVERTISING=x	BLE Advertiser operation status setting.			
AT+UART?	Device Uart communication setting information.	Baudrate : 115,200 Paritybit : None FlowControl : Enable		
AT+UART=b,p,f	Device Uart communication settings		O	
AT+MANUFDATA?	BLE Advertiser Manufacture information.			
AT+MANUFDATA=xxx	BLE Advertiser Manufacture setting.			
AT+ADVINTERVAL?	BLE Advertising Interval information.	160ms		
AT+ADVINTERVAL=ms	BLE Advertising Interval setting.			
AT+CONNINTERVAL?	BLE Connection Interval information.	Min : 6 (7.5ms) Max : 20 (25ms) Latency : 0 S_Timeout : 400 (4s)		
AT+CONNINTERVAL=m,m,l,s	BLE Connection Interval			

	setting.			
AT+TXPWR?	BLE wireless output strength information.	6 (0dBm)		
AT+TXPWR=x	BLE wireless output strength setting.			
AT+ADDRTYPE?	BLE Advertiser Address type information.	0 (Public Address)		
AT+ADDRTYPE=x	BLE Advertiser Address type setting.		O	
AT+SECURITY?	BLE Security information.	3 (IO caps none)		
AT+SECURITY=x	BLE Security settings.			
AT+LTK?	BLE bonded LTK information.			
AT+PASSKEY=xxxxxx	Enter BLE Passkey security data.			
AT+DELBOND	BLE all bonded data deleted.			
AT+SLEEP=x	BT Sleep mode operation setting.			

6.2 General Commands

6.2.1 AT

- **Description**
  UART TX/RX Path test between a BT module and Host device.

- **Examples**

(HOST→BT) : AT\r

(BT→HOST) : +OK\r

6.2.2 ATZ

- **Description**
  BT Device Software Reset.

- **Examples**

(HOST→BT) : ATZ\r

(BT→HOST) : +OK\r

--- Rebooting ---
--- Restart ---

(BT→HOST) : +READY\r

--- When 'Advertiser Enable' operates ---
--- In case of Advertiser Enable operation ---

(BT→HOST) : +ADVERTISING\r

6.2.3 ATO

- **Description**
  To change the state to transmit data to the other device after the BT module is connected to another BLE device,
  An error responds if connection with the other device is not established.
  When BT connects with the other device, the default operation is data transmission.

- **Examples**

(HOST→BT) : ATO\r

(BT→HOST) : +OK\r

6.2.4 AT&F

- **Description**

  This is a command for factory initialization of BT setting values. When using this command, the BT module initializes the device settings and executes Software Reset.
  An error responds if BT is connected to the other device.

- **Examples**

(HOST→BT) : AT&F\r

(BT→HOST) : +OK\r

--- Rebooting ---

(BT→HOST) : +READY\r

(BT→HOST) : +ADVERTISING\r

6.2.5 AT&S

- **Description**

  A command to save BT configuration information to Flash Memory

- **Info**

When using this command, the entire information used for setting Flash Memory in BT is saved.

Data storage list:

1. Device Name (“AT+NAME=xxx”)
2. Device Mac Address (“AT+ADDR=xxx”)
3. Device Uart Config (“AT+UART=b,p,f”)
4. BLE Manufacture data (“AT+MANUFDATA=ci,md”)
5. BLE Advertiser Interval (“AT+ADVINTERVAL=x”)
6. BLE Connection Interval (“AT+CONNINTERVAL=min,max”)
7. BLE TX Power (“AT+TXPWR=x”)
8. BLE Mac Address Type Config (“AT+ADDRTYPE=x”)
9. BLE Security Config (“AT+SECURITY=xxx”)
10. BLE Connection peer device Mac Address (none command)

- **Command Guide**

(HOST→BT) : AT+UART=xxx,x,x,x

(BT→HOST) : +OK\r

(HOST→BT) : AT+NAME=xxxxx

(BT→HOST) : +OK\r

(HOST→BT) : AT&S

(BT→HOST) : +OK\r

(HOST→BT) : ATZ\r

(BT→HOST) : +OK\r

--- Rebooting ---

(BT→HOST) : +READY\r

--- When ‘Advertiser Enable’ operates ---

(BT→HOST) : +ADVERTISING\r

- **Examples**

(HOST→BT) : AT&S\r

(BT→HOST) : +OK\r

6.2.6 AT+DISCONNECT

- **Description**
  Disconnects the BT connected with the other device.
  An error responds if BT is not connected with the other device.

- **Examples**

(HOST→BT) : AT+DISCONNECT

(BT→HOST) : +OK\r
--- Device disconnection completed ---
(BT→HOST) : +DISCONNECTED

6.2.7 AT+VER?

- **Description**
  Information on the module firmware version of BT

- **Examples**

(HOST→BT) : AT+VER?

(BT→HOST) : 1.0.0\r

6.2.8 AT+REMOTEADDR?

- **Description**
  MAC Address information on the other device to which BT was last connected.

- **Info**

A response “000000000000” is shown if there is no connection information with the other device

- **Info**

Data format : ASCII code in Hex data format

- **Examples**

(HOST→BT) : AT+REMOTEADDR?

(BT→HOST) : 74F07DABCDEF\r

6.2.9 AT+NAME?

- **Description**
  Information on the BT device name

- **Examples**

(HOST→BT) : AT+NAME?\r

(BT→HOST) : BCM-LN300-AS\r

6.2.1 AT+NAME=xxx

- **Description**
  Set the name of the BT device using the parameter data as ASCII data.
  An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code

- **Info**

Data beyond the maximum length that can be set is not applied. (Max 26byte)
Name Lens = total(31byte) – (manufacture data lens+2) - flag(3byte) – tx power(3byte)

- **Examples**

(HOST→BT) : AT+NAME=BCM-LN300\r

(BT→HOST) : +OK\r

6.2.2. AT+ADVINFO

- **Description**
  Information on the BT Advertiser operation. Displays the current advertising data value.

- **Info**

Data format : ASCII code in Hex data format

- **Examples**

(HOST→BT) : AT+ADVINFO?\r

(BT→HOST) : 020106020A5F0D0942434D2D4C4E3230302D4153\r

6.2.3. AT+ADVERTISING?

- **Description**
  Information on the BT Advertiser operation

- **Examples**

(HOST→BT) : AT+ADVERTISING?\r

(BT→HOST) : +ADVERTISING\r or +IDLE\r

6.2.4 AT+ADVERTISING=x

- **Description**
  Set the BT Advertiser operation using the parameter data as Decimal data.
  An error responds if BT is connected to the other device.

- **Info**

An Advertiser +OK\r response when the existing operation and a command input are the same.

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : Advertiser Disable.
1 : Advertiser Enable.
Other value error.

- **Examples**

(HOST→BT) : AT+ADVERTISING=1\r

(BT→HOST) : +IDLE\r or +ADVERTISING\r

(BT→HOST) : +OK\r

6.2.5 AT+UART?

- **Description**
  Information on BT Uart setting

- **Info**

Response data : Baudrate, ParityBit, FlowControl

- **Info**

Data format : ASCII code in Decimal data format

- **Examples**

(HOST→BT) : AT+UART?\r (BT→HOST) : 1000000,0,1\r

6.2.6 AT+UART=B,P,F

- **Description**

  Set the BT Uart using the parameter data as Decimal data.
  Data need to be saved when applied after reset.
  An error responds if BT is connected to the other device.

- **Range**

B = BaudRate	1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400, 250000, 460800, 921600, 1000000, Other value is error.
P = ParityBit	1 = Even Parity Bit 0 = None Parity Bit Other value error.
F = FlowControl	1 = Enable 0 = Disable Other value error.

- **Info**

Data format : ASCII code in Decimal data format

- **Examples**

(HOST→BT) : AT+UART=1000000,0,1\r (BT→HOST) : +OK\r

6.2..7 AT+MANUFDATA?

- **Description**
  Information on BT Advertiser Manufacture data

- **Info**
  Response data : Company identifier, Manufacture Data

- **Info**
  Data format : ASCII code in Decimal data format

- **Examples**
  (HOST→BT) : AT+MANUFDATA?\r
  (BT→HOST) : 29936,12345\r

6.2.8 AT+MANUFDATA=CI,MD

- **Description**
  Set the BT Advertiser Manufacture data using the parameter data as Decimal data.
  Parameter data is 0x2C (“, “: comma), 0x00 (NULL) data is not used.
  An error responds if BT is connected to the other device.

- **Info**
  CI = Company identifier. (2byte decimal data)
  MD = Manufacture data.

- **Info**
  Data format : ASCII code in Decimal data format

- **Info**
  An error responds if it exceeds the maximum length that can be set.
  Manufacture Lens = total(31byte) – (Device Name Lnes+2) – flag(3byte) – tx power(3byte)

- **Examples**
  (HOST→BT) : AT+MANUFDATA=29937,12345\r
  (BT→HOST) : +OK\r

6.2.9 AT+ADVINTERVAL?

- **Description**
  Information on BT Advertising Interval

- **Info**

Data format : ASCII code in Decimal data format Uint : 1 ms

- **Range**

Min : 20 ms Max : 10240 ms Other value error.

- **Examples**

(HOST→BT) : AT+ADVINTERVAL?\r (BT→HOST) : 160\r

6.2.10 AT+ADVINTERVAL=ms

- **Description**
  Information on BT Advertising Interval. Use the parameter data as Decimal data.
  An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code in Decimal data format Unit : 1 ms

- **Range**

20ms(min) ~ 10240ms(max) Other value error.

- **Examples**

(HOST→BT) : AT+ADVINTERVAL=160\r (BT→HOST) : +OK\r

6.2.11 AT+CONNINTERVAL?

- **Description**
  Information on BT Connection Interval

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

Min (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s) Max (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s) Latency : 0~ 499 (0x01F3) S_timeout (Unit : 10ms) : 0x000A (10 * 10ms = 100ms) ~ 0x0C80 (3200 * 10ms = 32s) Other value error.

- **Examples**

(HOST→BT) : AT+CONNINTERVAL?\r (BT→HOST) : 6,6\r

6.2.12 AT+CONNINTERVAL=min,max,latency,s_timeout

- **Description**
  Set the BT Connection Interval using the parameter data as Decimal data.
  An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code in Decimal data format. S_timeout = Supervision time out. Supervision time out setting value should be greater than ((latency+1)*MAX)*2.

- **Range**

Min (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s) Max (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s) Latency : 0~ 499 (0x01F3) S_timeout (Unit : 10ms) : 0x000A (10 * 10ms = 100ms) ~ 0x0C80 (3200 * 10ms = 32s) Other value error.

- **Examples**

(HOST→BT) : AT+CONNINTERVAL=6,20,0,400\r (BT→HOST) : +OK\r

6.2.13 AT+TXPWR?

- **Description**
  Information on BT Advertiser TX Power

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : -40dBm 1 : -20dBm 2 : -16Bm 3 : -12 dBm 4 : -8 dBm 5 : -4 dBm 6 : 0 dBm 7 : 4dBm Other value error.

- **Examples**

(HOST→BT) : AT+TXPWR?\r (BT→HOST) : 6\r

6.2.14 AT+TXPWR=P

- **Description**
  Set the BT Advertiser TX Power using the parameter data as Decimal data.
  An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : -40dBm 1 : -20dBm 2 : -16Bm 3 : -12 dBm 4 : -8 dBm 5 : -4 dBm 6 : 0 dBm 7 : 4dBm Other value error.

- **Examples**

(HOST→BT) : AT+TXPWR=6\r (BT→HOST) : +OK\r

6.2.15 AT+ADDRTYPE?

- **Description**
  Information on BT Advertiser Address type

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : Advertiser Public Address 1 : Advertiser Static Random Address Other value error.

- **Examples**

(HOST→BT) : AT+ADDRTYPE?\r (BT→HOST) : 0\r

6.2.16 AT+ADDRTYPE=x

- **Description**

  Set the BT Advertiser Address type setting using the parameter data as Decimal data.
  An error responds if BT is connected to the other device.
  When using BLE Random Address, reset is required after saving data.
  When using Random Address setting, BLE OTA function is not used.

  The BLE OTA function can only be operated by setting PUBLIC Address.
  When setting the Random Address, BT changes the BT Address information to Random every 15 minutes, or changes the Address information to Random after disconnecting the device.

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : Advertiser Public Address 1 : Advertiser Static Random Address Other value error.

- **Examples**

(HOST→BT) : AT+ADDRTYPE=1\r (BT→HOST) : +OK\r (HOST→BT) : AT&S\r (BT→HOST) : +OK\r (HOST→BT) : ATZ\r (BT→HOST) : +OK\r --- Rebooting --- --- Restart --- (BT→HOST) : +READY\r --- When ‘Advertiser Enable’ operates --- (BT→HOST) : +ADVERTISING\r

6.2.17 AT+SECURITY?

- **Description**
  Information on BT Security

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : IO Capabilities Display Only. 1 : IO Capabilities Display YES or NO. 2 : IO Capabilities Keyboard Only. 3 : IO Capabilities None. 4 : IO Capabilities Keyboard Display. Other value error.

- **Examples**

(HOST→BT) : AT+SECURITY?\r (BT→HOST) : 3\r

6.2.18 AT+SECURITY=x

- **Description**
  Set the BT Security using the parameter data as Decimal data.
  An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code in Decimal data format

- **Range**

0 : IO Capabilities Display Only. 1 : IO Capabilities Display YES or NO. 2 : IO Capabilities Keyboard Only. 3 : IO Capabilities None. 4 : IO Capabilities Keyboard Display. Other value error.

- **Examples**

(HOST→BT) : AT+SECURITY=3\r (BT→HOST) : +OK\r

6.2.19 AT+PASSKEY=xxxxxx

- **Description**

  Enter the 6-digit data displayed on the Central device when using the BT Security Keyboard setting.
  Using parameter data as Decimal data.
  An error responds if BT is not connected to the other device or does not receive Passkey input event.

- **Info**

Data format : ASCII code in Decimal data format

- **Examples**

(HOST→BT) : AT+PASSKEY=123456\r (BT→HOST) : +OK\r

6.2.20 AT+DELBOND

- **Description**

  Delete all BT BONDED data.
  An error responds if BT is connected to the other device.

- **Examples**

(HOST→BT) : AT+DELBOND\r (BT→HOST) : +OK\r

6.2.21 AT+SLEEP=x

- **Description**

  Set the BT module sleep mode operation. The default ‘idle sleep’ mode operates (Uart ON sleep mode) if a sleep mode operation is not set through a command

- **Info**

  Data format : ASCII code in Decimal data format

- **Range**

  0 : BT Uart module off sleep mode.
  1 : BT Deep sleep mode.
  Other value error.

- **Wakeup**

  0 : BT Uart off sleep mode
  ➔ PIO.00 both edge. (default low -> high -> low) -> Uart module init.
  ➔ Wakeup Delay (500mS)
  1 : BT Deep sleep mode.
  ➔ PIO.00 both edge. (default low -> high -> low) -> BT Device reset wake up.
  ➔ Wakeup Delay (500mS)

- **Examples**

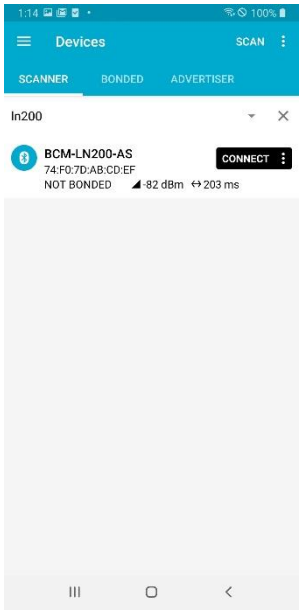
  (HOST→BT) : AT+SLEEP=0\r

  (BT→HOST) : +OK\r

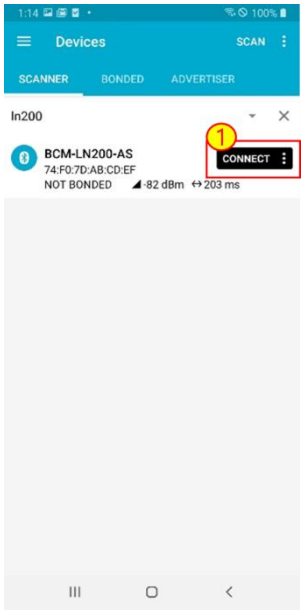
7. Over The Air Device Firmware Update Guide

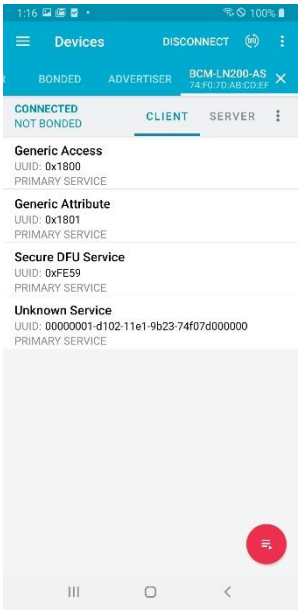
Nordic Application “nRF Connect” User Guide. Play store Download.

7.1 Ble Device Scan

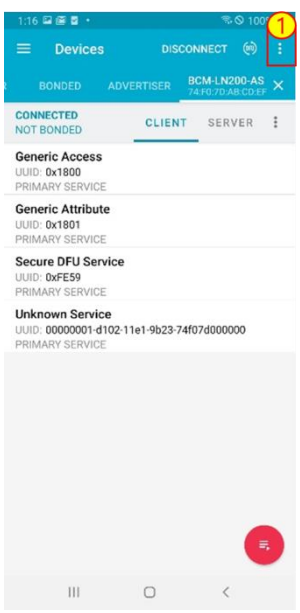


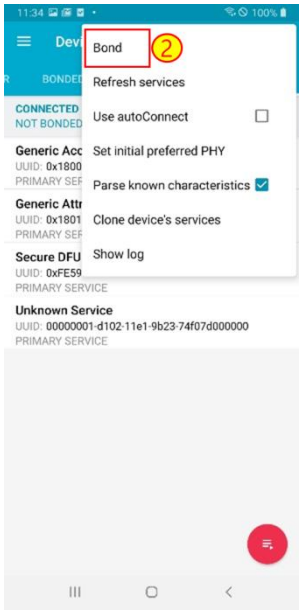
7.2 BLE Device Connect



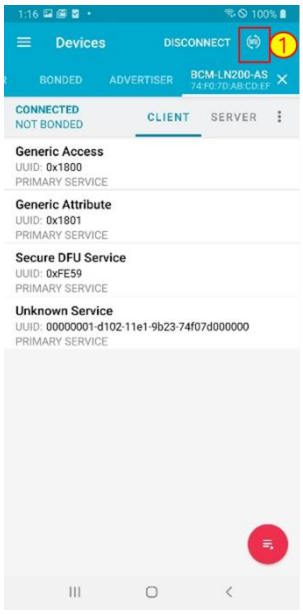


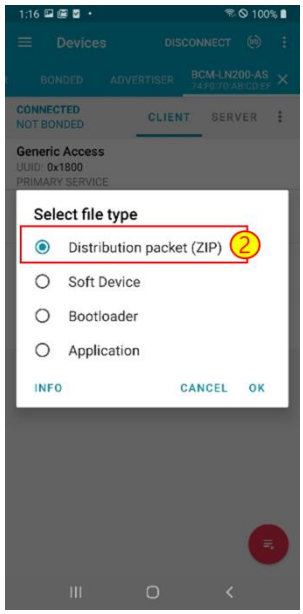
7.3 BLE Device Bonded

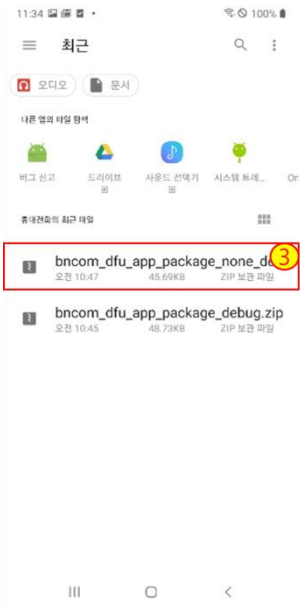




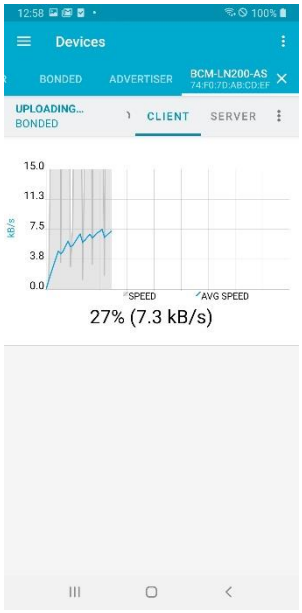
7.4 Update File Select



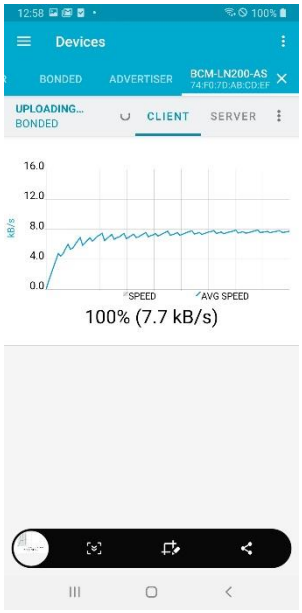




7.5 BLE Device Firmware Updating

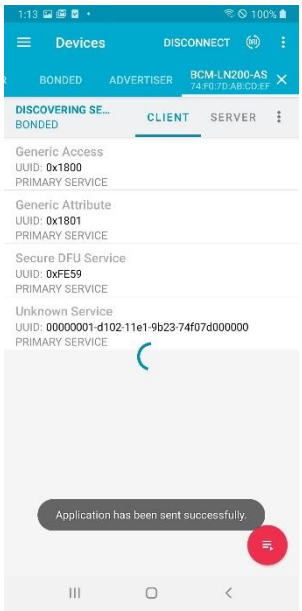


27% (7.3 kB/s)



100% (7.7 kB/s)

7.6 BLE Device Update Complete



FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

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.

(2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 or more 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.

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 20 cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2APDI-BCM-LA100-AS".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.