

BoT-nLE521M

AT COMMAND USER MANUAL

V 1.3.2

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1. Document Overview

This document defines the communication protocol through serial port (UART) between the Client only behavior on "CHIPSEN Bluetooth LE BoT-nLE521M Module " (hereinafter referred to as "BOT") and the customer's MCU (hereinafter referred to as "HOST") connected by UART interface.

2. Product Overview

- Operable Mode
 - **Client:** As the role of Master, Server mode can be searched and can be connected through UUID with the service in use by BOT
- Communication Mode
 - **Normal Phy:** Wireless communication is possible with general devices that support Bluetooth Low Energy. (Long Range Phy is not supported)
- Certification
 - **KC with EMC**
 - **CE RED_DOC with ROHS**
 - **FCC**
 - **TELEC**
 - **Bluetooth SIG (QDID: 139090)**
 - **IC**

3. Protocol Basic Rule

- The transmission/ reception of data between HOST and BOT is based on the UART (serial port) interface.
- UART (serial port) Default Setting
 - Baud rate: 9600bps
 - Data bit: 8
 - Parity bit: none
 - Stop bit: 1.
 - The above is the basic setting value, and if you want to change it, you can request a correction when writing the BOT firmware or use the appropriate AT command (AT+UART=xxxx).
- Communication direction
 - REQUEST (HOST→BOT): Transmit from HOST to BOT
 - NOTIFY (BOT → HOST): Message from BOT to HOST indicating the setup status of the BOT.
 - BOT.RESPONSE(BOT → HOST): Message from BOT to HOST, response to REQUEST
- Communication rule

All protocols consist of a combination of ascii values and announce the end of the command through a **CR (Carrage Return, 0x0D)**.

Ex) REQUEST – Current F/W Version: AT+VER?

Command	AT+VER?							
Command set	A	T	+	V	E	R	?	CR
Ascii set	0x41	0x54	0x2B	0x56	0x45	0x52	0x3F	0x0D

Ex) NOTIFY –When ready after power is applied: +READY.

Command	+READY						
Command set	+	R	E	A	D	Y	CR
Ascii set	0x2B	0x52	0x45	0x41	0x44	0x59	0x0D

Ex) RESPONSE – Operation failure for REQUEST: +ERROR

Command	+ERROR						
Command set	+	E	R	R	O	R	CR

Ascii set	0x2B	0x45	0x52	0x52	0x4F	0x52	0x0D
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3.1. Protocol Default Operation

- BOT receives the REQUEST from HOST and transmits a corresponding RESPONSE. HOST can basically expect a RESPONSE of + OK or + ERROR or receive a specific RESPONSE corresponding to REQUEST.

3.2. UART Operation Mode Description

- BOT supports three modes For HOST's DATA delivered to UART: AT-COMMAND, BYPASS mode, PACKET mode.
- If BOT generates high speed/continuous data during operation, errors including data omission may occur due to Bluetooth radio quality, performance, and usage environment.

In this case, information on the use and test environment should be provided for technical support, and technical support should be requested to review the problem-solving method through optimization of the setting of the BOT. (Technical support inquiry: s1@chipsen.com)

3.2.1. AT-COMMAND Mode

- In HOST, you can change the device settings of BOT or command BOT to perform a specific operation, which is called AT-COMMAND mode.
- Default mode that is sent to the remote device operates in BYPASS mode unless set separately to the BOT.
- Most of this document describes the commands available in AT-COMMAND mode.

3.2.2. BYPASS Mode

- It is a default mode that is transmitting to the remote device and operates in BYPASS mode unless it is set separately in BOT.
- BOT delivers HOST's DATA as soon as possible when delivering the data generated by HOST to the remote device, and this is called the BYPASS mode.
- In the BYPASS mode, it is impossible to change the device setting of the BOT or perform a specific operation, and it is possible to read some setting values or terminate the connection through the AT command GPIO setting.

- HOST's DATA in BYPASS mode can be split transmission or delayed transmission depending on the Bluetooth radio quality of the use environment or the Baud rate at which data is transferred to UART.

3.2.3. PACKET Mode

- When BOT delivers HOST's DATA to the remote device, it designates data of a certain size and supports a mode that can transmit data, it called PACKET mode.
- In PACKET mode, it is impossible to change the device setting of BOT or perform a specific operation, and it is possible to read some setting values or terminate the connection through the AT command GPIO setting.
- The transmission of DATA, which occurred in the HOST, and this range can be changed to 1~128 (bytes) range. Transmission is possible when the received data size is the same as the set transmission size.
 - * it should be possible to receive data of the size set by the remote device.

3.3. BOT state Description

- The BOT state is divided into **ADVERTISING**, **STANDBY**, **SCANNING**, **STOPPED**, **CONNECTED** and **DISCONNECTED** depending on the connection status of the remote device and the UART operation mode ("1.3. UART Operation Mode Description" check).

3.3.1. ADVERTISING

- It corresponds to SCANNING when searching for a Remote Server device, using specific commands after BOT power application (see AT+STARTSCAN command)
- In the SCANNING state, the UART operation mode is always in the AT-COMMAND mode.

3.3.2. STOPPED

- It corresponds to STOPPED when the BOT is not performing the SCANNING operation..
- In the STOPPED state, the UART operation mode is always in AT-COMMAND mode.

3.3.3. CONNECTED

- It means that it has already been connecting to the Remote device.
- When the AT Command/BYPASS port keeps low, all the data passed to Remote

device, if the port keeps to high, you can read some setting values of the BOT or perform a specific operation through the command.

3.3.4. DISCONNECTED

- when the connection with the remote devices is disconnected.
- According to the set Role, when it's a server, automatically switches to the ADVERTISING state, and if it's a client, It waits' for the user's REQUEST

4. BOT Control GPIO Description

To make it easier for HOST to control the state or control of the BOT, assign five GPIOs separately.

4.1. BoT-nLE521 GPIO define.

Pin PAD#	Direction	Pin Name	Function
#24	Input	P0.18	AT Command / BYPASS
#25	Output	P0.20	Connection Status
#19	Input	P0.12	Enter Sleep / Wakeup
#18	Input	P0.10	Disconnect & Factory reset
#23	Input	P0.16	UART On/Off

4.2. Function Description

4.2.1. AT Command / BYPASS

It operates in ATCOMMAND mode when high (Rising Edge) is maintained in CONNECTED state and operates in BYPASS or PACKET mode depend on user setting when low (Falling Edge) is maintained. Also, some of operating and inquiry commands can be activated with ATCOMMAND in the CONNECTED state. For each detail, refer to the corresponding Command Protocol

ATZ

AT&F

AT+DISCONNECT

AT+VER?

AT+INFO?

AT+FLOWCONTROL?

AT+CONNINTERVAL?

AT+NEGOCONN?

AT+AUTOSAVE?

4.2.2. Connection Status

Maintain High when connected with Client Device.

Keep low when disconnected with client device (Remote device).

4.2.3. Enter Sleep / Wakeup

When a high level (Rising Edge) is detected, it enters a low-power mode, and when a low level (Falling Edge) is detected, it wakes up and the module automatically reboots.

**** During low power operation, leakage current is generated by pull-down resistance of BOT internal, and leakage current consumed can be changed by applying an appropriate pull-down resistance to the outside and AT+INTPULLDOWN command**

4.2.4. Disconnect & Factory Reset

When a high level (Rising Edge) is detected, if it is connected to the client device other side, terminates the connection.

If the high level (Rising Edge) is maintained for more than 4 seconds, return to the factory initialization state after a +OK response.

4.2.5. UART On/Off

When a high level (Rising Edge) is detected, the UART is turned off to reduce the standby current.

when a Falling Edge (Lowel) is detected, UART communicates normally.

**** Even if UART is turned off at the high level, data from the Remote is automatically sent to HOST when data from the Remote is detected while it's connected to the Remote device, and if the Remote device does not make data more than 2 seconds, the UART automatically turns off again, reducing the standby power**

**** During low power operation, leakage current is generated by pull-down resistance of BOT internal, and leakage current consumed can be changed by applying an appropriate pull-down resistance to the outside and AT+INTPULLDOWN command**

5. REQUEST Protocol Detail

5.1. AT

Operation	HOST requests +OK to BOT
Commendable status	Not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" when BOT successfully received a request and performed AT command.
Examples of Use	(HOST→BOT): AT (BOT→HOST): +OK

5.2. ATZ

Operation	HOST requests BOT to reset
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	+OK or +ERROR
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" if BOT successfully received a request and performed AT command .and reset after 2sec. * Additional settings generated after command execution may not be saved because they are automatically reset.
Examples of Use	(HOST→BOT): ATZ (BOT→HOST): +OK ...after 2sec.. (BOT→HOST): +READY ➔ When you receive a +READY response, the reset is successful.

5.3. AT&F

Operation	When HOST Initialization changeable value of BOT																		
Response	+OK																		
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected																		
Response Completed	Within 20ms of receiving the command (based on 9600 bps)																		
Description	When BOT have successfully received a request and performed the command, respond "+OK" and set the setting value. And reset after 2sec. * AT Command mode is usable in connected state. (Default setting) <table> <tr> <td>1. UART:</td><td>2. Connection Interval: 20,40</td></tr> <tr> <td>: Baud rate: 9600bps</td><td></td></tr> <tr> <td>: Flow control: off</td><td></td></tr> <tr> <td>3. Auto Connect: OFF</td><td>4. PACKET MODE: OFF</td></tr> <tr> <td>5. Auto save: 1(enable)</td><td>6. Internal pull down: ON</td></tr> <tr> <td>7. Connection Interval</td><td>8. Tx Power: 5(-4dBm)</td></tr> <tr> <td>: firmware v0.8.0 or less - 20,40</td><td></td></tr> <tr> <td>: firmware v0.8.0 or more - 15,15</td><td></td></tr> <tr> <td>11. PACKET mode: OFF</td><td></td></tr> </table>	1. UART:	2. Connection Interval: 20,40	: Baud rate: 9600bps		: Flow control: off		3. Auto Connect: OFF	4. PACKET MODE: OFF	5. Auto save: 1(enable)	6. Internal pull down: ON	7. Connection Interval	8. Tx Power: 5(-4dBm)	: firmware v0.8.0 or less - 20,40		: firmware v0.8.0 or more - 15,15		11. PACKET mode: OFF	
1. UART:	2. Connection Interval: 20,40																		
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: firmware v0.8.0 or less - 20,40																			
: firmware v0.8.0 or more - 15,15																			
11. PACKET mode: OFF																			
Examples of Use	(HOST→BOT): AT&F (BOT→HOST): +OK ...after 2sec.. (BOT→HOST): +READY ➔ Reset after initializing the changeable value. When you receive a +READY response, the reset is successful.																		

5.4. AT+VER?

Operation	When you want to know the firmware version of BOT
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	Version Information (v[major]. [minor]. [release])

Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	firmware version is showed when command was performed by receiving request successfully. * AT Command mode is usable in Connect state
Examples of Use	(HOST→BOT): AT+VER? (BOT→HOST): v0.8.3. ➔ Reset after initializing the changeable value. When you receive a +READY response, the reset is successful.

5.5. AT+INFO?

Operation	When HOST want to know the address, Device Name, and Role status of the BOT
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	BOT Address, Device Name, Mode [Role], State
Response Completed	Within 60ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" if BOT successfully received a request and performed AT command and response Address as Device Name
Examples of Use	(HOST→BOT): AT+INFO? (BOT→HOST): 5C:F2:86:A0:00:01,CHIPSEN,SERVER[PERIPHERAL],ADVERTISING ➔ The HOST device can know the address of the BOT, the device name 'CHIPSEN', the Server Mode Peripheral Role, and the Advertising status information.

5.6. AT+UART=<baudrate>

Operation	When HOST change the baud-rate of the BOT
Commendable status	when not connected to the remote device
Response	+OK or +ERROR

Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" when BOT successfully received a request and performed AT command and Reset 2 seconds after changing the communication speed. If not, answer "+ERROR". Supported baud-rates are 2400, 4800, 9600, 14400, 28800, 19200, 38400, 57600, 115200, 230400, 460800. *Additional settings generated after command execution may not be saved because they are automatically reset.
Examples of Use	(HOST→BOT): AT+UART=9600 (BOT→HOST): +OK ... after 2sec.. (BOT→HOST): +READY

5.7. AT+FLOWCONTROL=xx

Operation	If HOST change the flow control status of the BOT
Commendable status	when not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" when BOT successfully received a request and performed AT command and Reset 2 seconds after changing the flow control status. If not, answer "+ERROR". ** <ONOFF>: "ON" or "OFF" *Additional settings generated after command execution may not be saved because they are automatically reset.
Examples of Use	(HOST→BOT): AT+FLOWCONTROL=ON (BOT→HOST): +OK ... after 2sec.. (BOT→HOST): +READY

5.8. AT+FLOWCONTROL?

Operation	When HOST wants to know whether flow control is used in communication with BOT
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	Flow Control (ON or OFF)
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	When BOT successfully receives the request and perform the command, the BOT will determine whether to use flow control Reply in ON/OFF format.
Examples of Use	(HOST→BOT): AT+FLOWCONTROL? (BOT→HOST): ON

5.9. AT+CONNINTERVAL=<max>

Operation	Change the BOT's Maximum Connection Interval
Commendable status	when not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command (Based on 9600 bps)
Description	Reply "+OK" when BOT successfully received a request and performed AT command. If not, answer "+ERROR" Input values can be entered up to four characters (20 to 2000), and the Minimum connection interval is automatically set to half of the input value. <max>20~2000 * If performed in the Advertising state, cancel the existing Advertising, apply the Connection Interval, and resume.
Examples of Use	(HOST→BOT) : AT+CONNINTERVAL=30 (BOT→HOST) : +OK Minimum connection interval is automatically set to 15ms because we requested a maximum connection interval of 30ms. If this command is performed during advertising, apply a new connection

	interval and restart advertising. **Maximum connection interval is recommended to be maintained at 30ms when operating with iOS counterparts, and errors may occur when operating with other values.
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5.10. AT+CONNINTERVAL=<min>, <max>

Operation	Change the BOT's Connection Interval
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	Reply "+OK" when BOT successfully received a request and performed AT command. If not, answer "+ERROR" Depending on the device being connected, the actual Connection Interval value that is negotiated may vary, and the Connection Parameter Update request may fail due to rejection from the device. <min> 10~1989 <max> 20~1999 * If performed in the Advertising state, cancel the existing Advertising, apply the Connection Interval, and resume. **When operating with an iOS counterpart device, recommend maintaining the Maximum connection interval 30ms. (If not, errors may occur) * AT Command mode is usable in Connect state
Examples of Use	(HOST→BOT): AT+CONNINTERVAL=30,50 (BOT→HOST): +OK Require Connection Interval 30ms~50ms When the command is performed during the advertising, Connection Interval is applied, and the advertising starts again.

5.11.AT+CONNINTERVAL?

Operation	when HOST wants to know BOT's Connection Interval
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	Display Connection Interval
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, BOT answered Connection Interval Value
Examples of Use	(HOST→BOT): AT+CONNINTERVAL? (BOT→HOST): 30,50

5.12.AT+NEGOCONN?

Operation	If Host want to know the Connection Interval setting when BOT is negotiated with Remote Device.
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device.
Response	Displays the current Negotiation value is shown
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, BOT answered negotiated Connection Interval value to two places.
Examples of Use	(HOST→BOT): AT+NEGOCONN? (BOT→HOST): 18.75

5.13.AT+DISCONNECT.

Operation	When BOT is in iBeacon mode, HOST changes the Rssi setting value of the BOT
Commendable	When the AT Command/BYPASS port remains High when connected to the

status	remote device.
Response	+OK and .. +DISCONNECTED or +ERROR
Response Completed	Within 100ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, BOT answered "+OK" and "+DISCONNECTED"
Examples of Use	(HOST→BOT): AT+DISCONNECT (BOT→HOST): +OK (BOT→HOST): +DISCONNECTED (BOT→HOST): +ADVERTISING

5.14.AT+STARTSCAN

Operation	While BOT is in Client mode, search for peripheral Server remote devices is performed, but the search results operate so that only three basic information can be received: "RSSI, Partner device address and name."
Commendable status	When not connected to the remote device
Response	+SCANNING or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT received the request normally, you get +SCANNING and start searching for peripherals. (TIP) If there are many peripherals and there is an abnormality in the output of search results through UART, the UART baud rate can be increased to stabilize the output of search results.
Examples of Use	(HOST→BOT) : AT+STARTSCAN (BOT→HOST) : +SCANNING (BOT→HOST) : +5CF286400002,-44,CHIPSEN (BOT→HOST) : +5CF286400005,-47,CHIPSEN The information on the searched device is shown below +<Server remote MAC>,<rssi>,<remote_name>

5.15.AT+STARTSCANM

Operation	While BOT is in Client mode, search for peripheral Server remote devices is performed, and the search results operate so that basic information can be received: "RSSI, Partner device address and name, also the advertising data"
Commendable status	When not connected to the remote device
Response	+SCANNING or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT received the request normally, you get +SCANNING and start searching for peripherals. (TIP) If there are many peripherals and there is an abnormality in the output of search results through UART, the UART baud rate can be increased to stabilize the output of search results.
Examples of Use	(HOST→BOT) : AT+STARTSCANM (BOT→HOST) : +SCANNING (BOT→HOST) : +5CF286400002,-44,CHIPSEN,12345 (BOT→HOST) : +5CF286400005,-47,CHIPSEN,advdata The information on the searched device is shown below +<Server remote MAC>,<rssi>,<remote_name>,<remote advertising data> The advertising data of the counterpart device outputs raw data in hexa-decimal form if there is no corresponding value in ascii data.

5.16.AT+STOPSCAN

Operation	Used when BOT ends scanning peripheral Server remote devices in Client mode
Commendable status	When not connected to the remote device
Response	+STOPPED or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT received the request normally, displays +STOPPED during

	stand by stopping search
Examples of Use	(BOT→HOST) : +5CF286400002,-44,CHIPSEN (BOT→HOST) : +5CF286400005,-47,CHIPSEN (HOST→BOT) : AT+STOPSCAN (BOT→HOST) : +STOPPED Search operation stopped after receiving command in progress

5.17.AT+CONMAC=<address>

Operation	Used when BOT try to connect to peripheral Server remote devices in Client mode
Commendable status	When not connected to the remote device
Response	+OK OR +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	+OK When BOT received the request normally If the connection is successful +CONNECTED[connected MAC] If not, +FAIL
Examples of Use	(HOST→BOT) : AT+CONMAC=5CF286400001 (BOT→HOST) : +OK (BOT→HOST) : +CONNECTED[5C:F2:86:40:00:01] OR (HOST→BOT) : AT+CONMAC=5CF286400001 (BOT→HOST) : +OK (BOT→HOST) : +FAIL → If it's connected successfully, displays remote device information (+CONNECTED[5C:F2:86:40:00:01]), if not notifies +FAIL ** In CLIENT mode, the remote device connected is limited to BoT-nLE series, and connection is not guaranteed for other devices.

5.18.AT+AUTOSAVE=

Operation	Used to set whether or not to save individual commands in memory for the setting value stored in memory.
Commendable	When not connected to the remote device

status	
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, reply +OK. If not, answer +ERROR and reset after 2sec. * : 0(disable) or 1(enable) * Additional settings generated after command performed may not be saved because they are automatically reset * If the Auto save function is set to 0 (disabled), the function that automatically resets and changes does not work for specific setting commands before 1 (enable). After setting it to 0 (disabled), all except ATZ and AT+AUTOSAVE are automatically reset when the user performs AT+SAVE, and the change value is applied. * Regardless of the Auto save function, commands that change immediately after setting to operate and confirm may operate and confirm with previous storage values if reset without performing AT+SAVE.
Examples of Use	(HOST→BOT) : AT+ AUTOSAVE =1 (BOT→HOST) : +OK ... after 2sec.. (BOT→HOST) : +READY

5.19.AT+ AUTOSAVE?

Operation	Use when BOT checks whether the current Autosave function is working
Commendable status	When the AT Command/BYPASS port remains High when connected to the remote device or when not connected
Response	1 OR 0
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request the command, reply 1(enabled) or 0(disabled). * Possible to perform on AT COMMAND mode when it's connected.
Examples of Use	(HOST→BOT) : AT+AUTOSAVE? (BOT→HOST) : 1

	→ Notify autosave function is ON.
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5.20. AT+SAVE

Operation	Use if BOT does not currently use autosave. Use when the user stores all the changed value while BOT is being powered.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, reply +OK. If not, answer +ERROR and reset after 2sec. * Command enabled only when auto-save is disabled (AT+AUTOSAVE=0). * Additional settings generated after command performed may not be saved because they are automatically reset * If the Auto save function is set to 0 (disabled), the function that automatically resets and changes does not work for specific setting commands before 1 (enable). After setting it to 0 (disabled), all except ATZ, AT&F, and AT+AUTOSAVE are automatically reset when the user performs AT+SAVE, and the change value is applied. * Regardless of the Auto save function, commands that change immediately after setting to operate and confirm may operate and confirm with previous storage values if reset without performing AT+SAVE.
Examples of Use	(HOST→BOT) : AT+SAVE (BOT→HOST) : +OK ... after 2sec.. (BOT→HOST) : +READY

5.21. AT+PACKETMODE=ON

Operation	Use when BOT that is connected to remote device tries to transfer data on a regular basis, and it is performed on PACKET mode
Commendable	When not connected to the remote device

status	
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, The data is delivered to the remote how the size is set through the AT+PACKETUNIT command. In PACKET mode, the data transmission period must be maintained at 15 ms or more.
Examples of Use	(HOST→BOT) : AT+PACKETMODE=ON (BOT→HOST) : +OK → BOT operates in PACKET mode when transmitting data to the remote device. In the PACKET mode ON state, transmission is made only when the data size set through the AT+PACKET UNIT command is received, and if a value smaller than the data set through the AT+PACKET UNIT command is entered, the data is not transmitted Therefore, the data must be a multiple of the PACKET unit and delivered. (TIP : If data is insufficient, it can be transmitted to fit the size of the PACKET unit including NULL data.)

5.22.AT+PACKETMODE=OFF

Operation	Use when BOT that is connected to remote device tries to transfer data on BYPASS mode.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, the data is transferred on BYPASS mode. The size or delay of the Data can be different depends on wireless environment.

Examples of Use	(HOST→BOT) : AT+PACKETMODE=OFF (BOT→HOST) : +OK → When BOT transfer data to remote device, it operates as PACKET mode
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5.23..AT+PACKETUNIT=xxx

Operation	When BOT connected with Remote device, Set the data size to be transmitted when operating in PACKET mode
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, In PACKET mode, it must be received at the data size set by the AT+PACKETUNIT command. *default size(bytes).: 20 *range(bytes): 1 ~ 128
Examples of Use	(HOST→BOT) : AT+ PACKETUNIT =64 (BOT→HOST) : +OK □ In PACKET mode, it must be received at the data size set by the AT+PACKETUNIT command. It is sent only if the sizes match exactly. Therefore, PACKET UNIT's drainage data must be configured and delivered. (TIP: If there is not enough data, it can be transmitted to match the size of PACKET UNIT including NULL data)

5.24.AT+PACKETINFO?

Operation	when HOST wants to know BOT's PACKET mode setting value
Commendable status	When not connected to the remote device
Response	PACKETMODE state, PACKET size
Response Completed	Within 8ms of receiving the command

Description	When BOT successfully received the request and performed the command, BOT answered PACKETMODE state, PACKET size
Examples of Use	(HOST→BOT): AT+ PACKETINFO? (BOT→HOST): ON,64

5.25.AT+INTPULLDOWN=ON

Operation	Set to enable for internal pull-down resistance inside the module in UART On/Off, Enter Sleep / Wakeup GPIO.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command
Description	When BOT successfully received the request and performed the command, Use the internal pull-down resistor. In addition, when UART On/Off and Enter Sleep/Wakeup input signals are generated, leakage current is generated according to internal resistance (300 to 400 uA based on 3.3 V)
Examples of Use	(HOST→BOT): AT+ INTPULLDOWN =ON (BOT→HOST): +OK ...after 2sec.. (BOT→HOST): +READY ➔ Default ON, reboot 2 seconds after receiving the command and the setting takes effect.

5.26.AT+INTPULLDOWN=OFF

Operation	Set to disable for internal pull-down resistance inside the module in UART On/Off, Enter Sleep / Wakeup GPIO.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command
Description	When BOT successfully received the request and performed the command,

	don't use the internal pull-down resistor. UART On/Off , Enter Sleep / Wakeup When an input signal is generated, a leakage current is generated according to an external pull-down resistance value. * If the external pull-down resistance is not applied, the BOT may not operate normally, so in this case, the pull-down resistance must be applied to the outside.
Examples of Use	(HOST→BOT): AT+ INTPULLDOWN =OFF (BOT→HOST): +OK ...after 2sec.. (BOT→HOST): +READY

5.27.AT+INTPULLDOWN?

Operation	When HOST wants to Know internal pull-down resistance On/Off inside the module in UART On/Off, Enter Sleep / Wakeup GPIO.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command
Description	When BOT successfully received the request and performed the command, BOT answered Internal pull-down resistance On/Off
Examples of Use	(HOST→BOT): AT+ INTPULLDOWN? (BOT→HOST): ON **This command applies only to v0.8.0 and later versions

5.28.AT+AUTOCON=ON

Operation	If you want BOT automatically to connect to the BOT-nLE series of the recently connected SERVER role whenever the power is supplied while BOT operates as Client. When it works above, BOT tries to connect recent device in 5sec after the power is supplied. If 5seconds have passed, it tries not to connect anymore and waits for the next command as Client role.
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Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command
Description	Use if you want BOT to auto-connect to recent connected device, when BOT reboots through power supply or command in Client mode
Examples of Use	(HOST→BOT) : AT+ AUTOCON=ON (BOT→HOST) : +OK ...after 2sec.. (BOT→HOST) : +READY (BOT→HOST) : +CLIENT (BOT→HOST) : +CONNECTED[5C:F2:86:40:00:01] → When the power is supplied again, it's automatically connected to recent connected device.

5.29. AT+AUTOCON=OFF

Operation	When BOT operates as Client, set to not perform auto connection.
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 8ms of receiving the command
Description	Use when BOT is only allowed to operate as user commands after rebooting through power supply or command in Client mode
Examples of Use	(HOST→BOT) : AT+ AUTOCON=OFF (BOT→HOST) : +OK ...after 2sec.. (BOT→HOST) : +READY (BOT→HOST) : +CLIENT → Even if re-reply power is performed, it's not automatically connected to the recent connection device and waits for the user's command for the Client.

5.30.AT+AUTOCON?

Operation	Use when checking the information of the device connected latest or whether BOT uses auto connection or not
Commendable status	When not connected to the remote device
Response	ON.[Address] or OFF.[Address]
Response Completed	Within 8ms of receiving the command
Description	Possible to check the setting status of the automatic connection function and the address of the latest device when BoT reboots through power supply or commands in Client mode
Examples of Use	(HOST→BOT) : AT+ AUTOCON? (BOT→HOST) : ON,[5C:F2:86:40:01:23] or (HOST→BOT) : AT+ AUTOCON? (BOT→HOST) : OFF,[5C:F2:86:40:01:23] → Now possible to check setting status of auto connection and the address of the latest connected device

5.31.AT+CONNRSSI?

Operation	When BOT is connected with Remote device, to check the RSSI of the BOT
Response	+OK or +ERROR
Response Completed	Within 100ms of receiving the command
Description	When BOT is connected with Remote device, upon receiving the corresponding command, it is possible to check the current communication channel and the sensitivity of the wireless reception signal. The reception sensitivity responds with a negative number, and the larger the value, the greater the signal strength. ** Because it is connected to the Remote device, you must set AT command/Bypass GPIO to High and change it to AT command mode.
Examples of Use	(HOST→BOT): AT+ CONNRSSI? (BOT→HOST): CH[13],RSSI[-55]

	➔ Currently communicating on channel 13 and -55 dBm reception sensitivity is confirmed. The channel and reception sensitivity can be changed each time an AT command is receive. **This command applies only to v1.0.0 and later versions
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5.32. AT+SF=ON,<filter_name>

Operation	Used when BOT is set to output only search results for peripheral devices that names starting with <filter_name> while BOT scans
Commendable status	When not connected to the remote device
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command
Description	Reply "+OK" when BOT successfully received a request and performed AT command. If not, answer "+ERROR" <name> : Up to 8 character, when scanning for peripherals, search for the same device as the name set from the beginning of the name
Examples of Use	(HOST→BOT) : AT+SF=ON,CHIPSEN (BOT→HOST) : +OK (HOST→BOT) : AT+STARTSCAN (BOT→HOST) : +SCANNING (BOT→HOST) : +5CF286400002,-44,CHIPSEN1 (BOT→HOST) : +5CF286400005,-47,CHIPSEN2 ➔ When scanning BOT on remote device, it informs only peripheral device is set to name CHIPSEN

5.33. AT+SF=OFF

Operation	Use when BOT scans all devices around you without considering the remote device name and informs you of the results.
Commendable	When not connected to the remote device

status	
Response	+OK or +ERROR
Response Completed	Within 20ms of receiving the command
Description	When BOT successfully received the request and performed the command, reply +OK. If not, answer +ERROR
Examples of Use	(HOST→BOT) : AT+SF=OFF (BOT→HOST) : +OK (HOST→BOT) : AT+STARTSCAN (BOT→HOST) : +SCANNING (BOT→HOST) : +5CF286400002,-44,CHIPSEN (BOT→HOST) : +123456789abc,-50,TEST (BOT→HOST) : +abcdef012345,-66,Unnamed (BOT→HOST) : +5CF286400005,-47,CHIPSEN → When scanning BOT on remote device, it finds all the devices around it and informs HOST of the results.

5.34.AT+SF?

Operation	Use to verify that BOT is set to look only for specific devices when it scans for devices.
Commendable status	When not connected to the remote device
Response	ON or OFF
Response Completed	Within 10ms of receiving the command (based on 9600 bps)
Description	When BOT successfully received the request and performed the command, If it's set to scan only specific devices, reply ON If not, answer OFF
Examples of Use	(HOST→BOT) : AT+ SF? (BOT→HOST) : OFF → Possible to verify that BOT isn't set to scan specific devices only.

6. General Data transmission

After SERVER and CLIENT BLE device are connected, data that received UART or data transmitted through BLE link from the other device are automatically transmitted without any form conversion.

States	SERVER and CLIENT Connected
Examples of Use	(HOST→BOT): ABCD<CR> (Remote device): ABCD<CR>

7. Service UUID Information

For connection with the remote device, a custom data transmission/reception service is provided through the service UUID. Therefore, if you connect BOT to a smartphone or other device, use it according to the table (UUID) below.

Service	UUID	Property
Custom Data service (Primary)	0xFFFF0	N/A
Data Out service	0xFFFF1	Notification
Data In service	0xFFFF2	Write / Write without Response **firmware v0.7.2 and earlier only support Write properties

*16bit UUID 0xFFFF0 to 128-bit UUID: 0000FFFF0-0000-1000-8000-00805F9B34FB

*16bit UUID 0xFFFF1 to 128-bit UUID: 0000FFFF1-0000-1000-8000-00805F9B34FB

*16bit UUID 0xFFFF2 to 128-bit UUID: 0000FFFF2-0000-1000-8000-00805F9B34FB

** Property Description

Notification: Used when data is sent from BoT-nLE521 to remote device

Write: It is used when data is transmitted from the remote device to BoT-nLE521, and after the data is transmitted, the completion of the transmission is confirmed through the response of BoT-nLE521.

Write without Response: It is used when data is transmitted from the remote device to BoT-nLE521, No separate response from BoT-nLE521 after data transfer.

Appendix 1. Limitations of Liability and Legal Notice

★ This product may cause radio confusion during use and may receive harmful interference from other devices. Therefore, there may be data transfer delays or losses, and users are advised to take this into consideration and use it after sufficient testing. Due to the nature of the radio, there is no guarantee of accuracy, reliability or completeness, nor is there any responsibility. In no event shall Chipsen Co., Ltd. or Seller's liability limit exceed the paid selling price of the product.

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