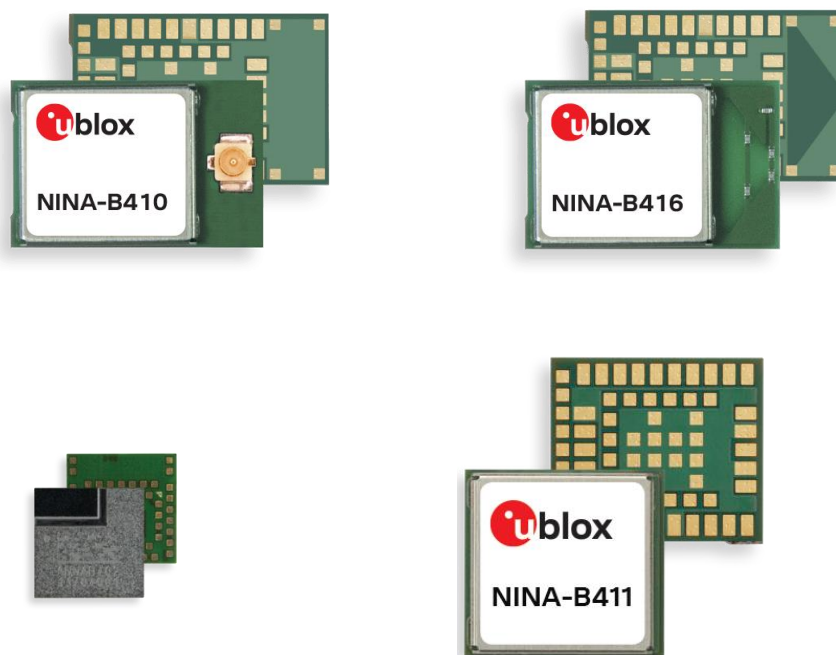# ANNA-B412 and NINA-B4 series radio testing

Bluetooth certification test tools

Application note

Abstract

This application note describes the AT commands used for radio testing and verification of ANNA-B412 and NINA-B4 series modules.

Document information

Title	**ANNA-B412 and NINA-B4 series radio testing**
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This document applies to the following products:

Product name
NINA-B410
NINA-B411
NINA-B416
ANNA-B412

Contents

1 Overview

This application note describes the AT commands used for radio testing and verification of ANNA-B412 and NINA-B4 series modules. The AT commands featured in this document are available in confidential radio test software executed in RAM.

☞ For access to the radio test software, contact your local u-blox support office. See also Contact.

2 Flashing test software to RAM

The radio test download file uses an XMODEM protocol. UART hardware flow control is not used during the software update. For information about the firmware update commands See the u-connectXpress AT commands manual [1], ANNA-B4 System Integration Manual [5], and the NINA-B4 System Integration Manual [2].

☞ The XMODEM protocol featured in this procedure uses standard XMODEM-CRC16 protocol and 128 bytes packets.

Follow the procedure below to flash the test software to RAM:

1. Enter bootloader mode:
   a) Press the SW1 and SW2 buttons during a module reset, or
   b) Enter the AT command - `AT+UFWUPD=1,115200`

   ```
   AT+UFWUPD=1,115200
   >
   ```

2. Enter the command `s <imageid> <signature>` to store the signature of the test software. The test software image id is 0. The signature is available in the `NINA-B41X-PROD-SI-xx-xxx.txt` file.

   ```
   > s 0 <signature>
   OK
   ```

3. Enter the command `x <imageaddress> <imagesize> <imagename> <permissions> <imageid>` to trigger the bootloader into accepting a file transfer using the XMODEM protocol. Use the RAM address `20008000`. The size of the binary image file must be specified in hex. Set the permissions to `rwx` (read/write/execute).

   ```
   > x 20008000 A65C NINA-B4-TEST rwx 0
   ```

   When a "`C`" character is received from the module, the XMODEM download is ready to begin from the host.

   ```
   > x 20008000 A65C NINA-B4-TEST rwx 0
   CCCCCC
   ```

4. After a successful file transfer, enter the command `b <imageid>` command to start up the test software.

   ```
   > b 0
   +STARTUP
   ```

3 Bluetooth test commands

AT test commands can only be run when the device is in production mode.

3.1 Bluetooth LE set PHY +UPRODBTLEPHY

Command	Description
AT+ UPRODBTLEPHY =<phy_type>	Sets PHY for the Bluetooth LE receiver and LE transmitter test. The setting has no direct effect. These tests must be restarted before applying the setting.
Parameters	**Description**
phy_type	1 MB: 1 MBit PHY 2 MB: 2 MBit PHY CODEDS8: Coded PHY with S=8 CODEDS2: Coded PHY with S=2
Responses	**Description**
<CR><LF>OK<CR><LF>	Successful write response
<CR><LF>ERROR<CR><LF>	Error response

3.2 Bluetooth LE receiver test +UPRODBTLERX

☞ The test software only supports UART speed 115200 bps.

Command	Description
AT+UPRODBTLERX=<rx_channel>	Starts the Bluetooth low energy (LE) receiver test. The number of received RX packets can be read using the Bluetooth LE Test end +UPRODBTLETE command.
Parameters	**Description**
rx_channel	Receiver channel. Valid channels are 0-39. Note that this is the physical channel. For more information about the channel numbering, see reference [3].
Responses	**Description**
<CR><LF>OK<CR><LF>	Successful write response
<CR><LF>ERROR<CR><LF>	Error response

3.3 Bluetooth LE transmitter test +UPRODBTLETX

Command	Description
AT+UPRODBTLETX=<tx_channel>, <packet_length>,<packet_payload>, ,[<power_level>]	Starts the Bluetooth LE transmitter test. Default output power is used (8 dBi).
Parameters	**Value**
tx_channel	Transmitter channel. Valid channels are 0-39. Note that this is the physical channel. For more information about the channel numbering, see reference [3].
packet_length	Packet length (0 - 255)
packet_payload	Payload 0: Pseudo-Random bit sequence 9 1: Bit pattern 11110000 (LSB is the leftmost bit) 2: Bit pattern 10101010 (LSB is the leftmost bit) 3: * Bit pattern 11111111 *Supported by Coded PHY only

Command	Description
power level	Valid parameter values are -40, -20, -16, -12, -8, -4, 0, 4, 6 and 8 dBm; the parameter value is linear to the output power (in dBm).
	⚠ European market regulations require the maximum output power of the radio to be limited. Using an output power setting higher than 6 may void the European regulations. See the respective system integration manual for more information [2][5].

Responses	Description
<CR><LF>OK<CR><LF>	Successful write response
<CR><LF>ERROR<CR><LF>	Error response

3.4 Bluetooth LE Test end +UPRODBTLETE

Command	Description
AT+UPRODBTLETE	Ends the Bluetooth LE receiver or transmitter test
Parameters	Value
rx_packets	Number of received RX packets
Responses	Description
<CR><LF>+UPRODBTLE:<rx_packets><CR><LF><CR><LF>OK<CR><LF>	Successful write response
<CR><LF>ERROR<CR><LF>	Error response

Appendix

A Glossary

Abbreviation	Definition
LE	Low Energy
DTM	Direct Test Mode
PHY	Physical Layer
RAM	Random Access Memory
Rx	Receive
Tx	Transmit

Table 1: Explanation of the abbreviations and terms used

Related documentation

[1] u-connectXpress AT commands manual, UBX-14044127
[2] NINA-B4 series system integration manual, UBX-19052230
[3] Bluetooth Core Specification v 5.2, Vol. 6, part B, chapter 1.4.1 + Vol. 6, part F, chapter 4
[4] NINA-B41 data sheet, UBX-20035327
[5] ANNA-B4 System Integration Manual, UBX-21000517
[6] ANNA-B412 DataSheet, UBX-21028698

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Revision history

Revision	Date	Name	Comments
R01	26-Feb-2021	mape	Initial release
R02	28-May-2021	mape	Added NINA-B411 and qualified content and revised disclosure restriction for general distribution.
R03	3-Jul-2023	mape	Added ANNA-B412 to document scope. Updated contact information.

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For further support and contact information, visit us at www.u-blox.com/support.