u-connectXpress

Bootloader

Protocol specification

Abstract

Description of standard and proprietary bootloader commands used with u-blox short range, stand-alone modules.

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Document information

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This document applies to the following products:

Product name	Type number	u-connectXpress software version
ANNA-B112	All	All
ANNA-B412	All	All
NINA-B111	NINA-B111-03B-00 or later	4.0.0 or later
NINA-B112	NINA-B112-03B-00 or later	4.0.0 or later
NINA-B221	All	All
NINA-B222	All	All
NINA-B311	All	All
NINA-B312	All	All
NINA-B316	All	All
NINA-B410	All	All
NINA-B411	All	All
NINA-B416	All	All
NINA-W131	All	All
NINA-W132	All	All
NINA-W151	All	All
NINA-W152	All	All
NINA-W156	All	3.1.0 or later
ODIN-W260	All	All
ODIN-W262	All	All
ODIN-W263	All	7.1.0 or later

Contents

1 Introduction

This document is the description of standard and proprietary bootloader commands used with u-blox short range stand-alone modules. The bootloader commands provide options to modify flash memory and update the firmware that is being executed. See also Software update examples.

2 General commands

All input and output parameters of the commands in this section are in HEX format.

2.1 Help

Command	Description
?	Opens the bootloader help menu and listing all supported commands.
Response	**Description**
<productname> bootloader <bootversion> u-blox All parameters in HEX format <availableoptions> OK	Successful response.

2.2 Device information

Command	Description
I	Gets the unique identifier of the MCU.
Response	**Description**
UID: <MCU id> OK	Successful response.

2.3 Serial baud rate

Command	Description
r <baudrate>	Sets the baudrate of the serial port.
Parameter	**Description**
baudrate	Baudrate of the serial port UART in hexadecimal Acceptable values: 2580, 4B00, 9600, 1C200, 38400, 70800, E1000. **Note:** ODIN-W26 does not accept 0xE1000. **Note:** NINA-B1 Software version 4.0.0 and ANNA-B112 support only 1C200.
Response	**Description**
OK	Successful response.
ERROR	Error response.

2.4 Reset module

Command	Description
q	Reset the module.
Response	**Description**
>	**Note:** OK will NOT be obtained. Module will reset upon success. If no valid connectivity software is configured, a new bootloader prompt will be obtained. If a valid connectivity software is available, the bootloader will boot into that software.

2.5 Dump flash memory

Command	Description
`d <startaddress> <size>`	Dump bytes of the flash memory from the start address. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as part of every software release.
Parameter	**Description**
`startaddress`	Start address of the flash area to be erased.
`size`	Number of bytes to be dumped.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

2.6 Erase flash memory

Command	Description
`e <startaddress> <size>`	Erase bytes of the flash memory from the start address. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as part of every software release.
Parameter	**Description**
`startaddress`	Start address of the flash area to be erased. **Note:** If startaddress is not a multiple of flash sector size, the entire flash page (in which this address lies in) will be erased.
`size`	Number of bytes to be erased. **Note:** if the startaddress + size is not a multiple of flash sector size, the entire flash page (in which this address lies) will be erased.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

2.7 Boot image

Command	Description
`b <imageaddress>`	Executes (boots into) the binary image at the mentioned address.
Parameter	**Description**
`imageaddress`	Start address of the binary image in the flash. **Note:** This information is usually available in the `configuration.json` file of every software release.
Response	**Description**
`ERROR`	Error response.
	Note: OK will NOT be obtained upon Success. If a valid connectivity software is available, the bootloader will boot into that software.

2.8 Download binary image

Command	Description
`x <imageaddress>`	Downloads a binary image using x-modem protocols in the corresponding flash address.
Parameter	**Description**
`imageaddress`	Start address of the binary image in the flash. **Note:** This information is usually available in the `configuration.json` file of every software release.
Response	**Description**
`CCCCCC….` `OK`	Successful response.
`ERROR`	Error response.

2.9 Version

☞ This command is supported by NINA-W13 bootloader from version 2.0.0, NINA-W15 bootloader from version 2.0.0, NINA-B2 bootloader from version 2.0.0.

Command	Description
`v`	Returns version of bootloader
Response	**Description**
`<bootversion>` `OK`	Successful response.
`ERROR`	Command not supported. Use the Help command to obtain the information instead.

3 Secure boot commands

These commands can be run only when the device has secure boot inbuilt in it. All input and output parameters of the commands in this section are in HEX format.

☞ These commands can NOT be executed in ODIN-W2, NINA-B1, and ANNA-B112.

3.1 Boot image

Command	Description
`b <imageid>`	Executes (boots into) the binary image.
Parameter	**Description**
`imageid`	Id of the secure binary image. This value can also be replaced with the start address of the secure binary image in the flash. **Note:** This information is usually available in the `configuration.json` file of every software release.
Response	**Description**
`ERROR`	Error response.
	Note: OK will NOT be obtained upon Success. If a valid connectivity software is available, the bootloader will boot into that software.

3.2 Download binary image

Command	Description
`x <imageaddress> <imagesize> <imagename> <permissions> <imageid>`	Downloads a binary image using x-modem protocols in the corresponding flash address. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as part of every software release.
Parameter	**Description**
`imageaddress`	Start address of the secure binary image in the flash.
`imagesize`	Size of the secure binary image in bytes.
`imagename`	Name of the binary image. Maximum length of the name is 22 characters.
`permissions`	Access permissions for the bootloader over this binary image: 'r': Read 'w': Write 'x': Execute
imageid	Id of the secure binary image.
Response	**Description**
`CCCCCCC….` `OK`	Successful response.
`ERROR`	Error response.

3.3 Store image signature

Command	Description
`s <imageid> <signature>`	Store the secure binary image's signature in the bootloader. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as part of every software release.
Parameter	**Description**
`imageid`	Id of the secure binary image.
`signature`	The base64 encoded signature string.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

3.4 Set startup firmware

Command	Description
`f <imageid>`	Stores a particular binary image as the startup image. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as part of every software release. **Note**: This command must be issued after the binary image has been downloaded.
Parameter	**Description**
`imageid`	Id of the secure binary image.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

3.5 Dump hash of memory

Command	Description
`h <startaddress> <size>`	Calculates the SHA256 digest of the given flash region. **Note:** All values of the different parameters used in this command are available in the `configuration.json` file as a part of every software release.
Parameter	**Description**
`startaddress`	Start address of the flash area to be hashed.
`size`	Number of bytes to be hashed.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

3.6 List all images

Command	Description
l	List all the secure binary images in the flash.
Response	**Description**

`Image_id 0`
`Image_name yyyyy`
`Image_addr FFFFF`
……
…..
`OK`
	Successful write response

4 Miscellaneous commands

These commands are specific for certain devices and cannot be classified into any other category. All input and output parameters of the commands in this section are in HEX format.

4.1 CRC check

Command	Description
`c <imagetype> <imagesize> <crc32value>`	Performs a CRC32 check and a dual banked swap of the softdevice **Note:** This command is applicable only for NINA-B1 and ANNA-B112. **Note:** Values of the different parameters used in this command are available in the `configuration.json` file as part of every software release.
Parameter	**Description**
`imagetype`	Type of the binary image. Acceptable values: SOFTDEVICE **Note:** This parameter is case sensitive.
`imagesize`	Size of the softdevice image in bytes.
`crc32value`	The Crc32 value of the softdevice binary image.
Response	**Description**
`OK`	Successful response.
`ERROR`	Error response.

5 Software update examples

This section provides examples of how to update the firmware for u-blox modules. This section assumes that the modules are already in boot rescue mode. Check the System Integration Manual of the corresponding modules for instructions on how to enter the boot rescue mode. To execute the connectivity software from the boot rescue mode, use the boot command or reset the module.

☞ Change serial port baud rate to the highest permissible speeds using the Serial Baud Rate command.

☞ Parameter values used here are examples. Check the `configuration.json` file in the software release for actual values.

5.1 ODIN-W2

Use the x-modem command to update the firmware in the flash memory.

```
> x 8010000
CCCCCCC.....
OK
> b 8010000
+STARTUP
```

5.2 NINA-B1 and ANNA-B112

NINA-B1 and ANNA-B112 firmware updates involve a soft device update followed by a connectivity software update. Soft device updates are dual banked and need to pass a CRC check before the actual swap.

⚠ A soft device update invalidates the connectivity software. So always update the connectivity software after a soft device update.

```
> x 0
CCCCCCC.....
OK
> c SOFTDEVICE 22A48 7A9F9312
OK
> x 23000
CCCCCCC.....
OK
> q
+STARTUP
```

5.3 ANNA-B412, NINA-B31, and NINA-B41

ANNA-B412, NINA-B31 and NINA-B41 firmware updates involve a soft device update followed by a connectivity software update. Soft device updates are dual banked and need to pass the secure boot signature verification before the actual swap. Always input a signature for the binary image before starting its x-modem download.

⚠ A soft device update invalidates the connectivity software. So always update the connectivity software after a soft device update.

```
> s 1 1/IeYxT4HHrosE77FsLry6EUPqTXpazBkcmN7kwutBySTiXDL7IHKjtX2wzpUjyPCnF/g==
OK
> x 0 210F8 NINA-B3-SOFTDEVICE rw 1
CCCCCCC.....
OK
> s 0 z6V5hMPfsppfnaYqMTac604pnF++RvlcGT//UdHZsEe2JUj4+dqtq/g==
OK
> x 22000 4b8E4 NINA-B3-FIRMWARE rwx 0
```

```
CCCCCCC……
OK
> f 0
OK
> q
+STARTUP
```

The RAM can also be used to securely execute applications. (Production test software uses RAM). To use the RAM, go to boot mode using the buttons or AT+UFWUPD=1 command.

```
> s 0 l/IeYxT4HHrosE77FsLry6EUPqTXpazBkcmN7kwutBySTiXDL7IHKjtX2wzpUjyPCnF/g==
OK
> x 20028000 10F8 NINA-B3-PRODUCTION rwx 0
CCCCC……
OK
> b 0
```

The module should have booted into the software at the given address (in this example 0x20028000).

5.4 NINA-W13-SW1.0.0

NINA-W13 connectivity software requires a few other binary images besides the actual software such as partition table. Use the x-modem command to flash it in. Always input a signature for the binary image before starting its x-modem download.

Once the firmware has been upgraded, this is no longer required.

```
> x 13000
CCCCCCC……
OK
> s 0 p/pfnaYqMTac604pnF++Rvlcas342daGT//UdHZsEe2JUj4+dqtq/g==
OK
> x 20000 A6170 NINA-W1-FIRMWARE rwx 0
CCCCCCC……
OK
> f 0
> b 20000
+STARTUP
```

5.5 NINA-B2, NINA-W15, and NINA-W13 from v2.0.0

Use the x-modem command to update the firmware in the flash memory. Always input a signature for the binary image before starting its x-modem download.

```
> s 0 p/pfnaYqMTac604pnF++Rvlcas342daGT//UdHZsEe2JUj4+dqtq/g==
OK
> x 20000 A6170 FIRMWARE rwx 0
CCCCCCC……
OK
> f 0
> b 0
+STARTUP
```

Related documents

[1] u-connectXpress AT commands manual, UBX-14044127
[2] ODIN-W2 system integration manual, UBX-14040040
[3] NINA-B1 system integration manual, UBX-15026175
[4] ANNA-B112 system integration manual, UBX-18009821
[5] NINA-W1 system integration manual, UBX- 17005730
[6] NINA-B3 system integration manual, UBX-17056748
[7] u-connectXpress user guide, UBX-16024251
[8] NINA-B2 system integration manual, UBX-18011096
[9] NINA-B4 system integration manual, UBX-19052230
[10] ANNA-B4 system integration manual, UBX-21000517

☞ For product change notifications and regular updates of u-blox documentation, register on our website, www.u-blox.com.

Revision history

Revision	Date	Name	Comments
R01	18-Jun-2019	hvig, lhau, kgom	Initial release.
R02	19-Dec-2019	lhau, mlju	Update table on page 2 with ODIN-W263. Added chapter 2.9.
R03	04-Feb-2021	flun	Included NINA-B316, NINA-B41, NINA-W156. Clarified that the f command must be issued after the binary image has been downloaded for modules with secure boot. Renamed document.
R04	22-Oct-2021	hisa	Included NINA-B411, ANNA-B412.

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