

# u-blox Bootloader

## Protocol Specification

### Abstract

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

# Document Information

<b>Title</b>	<b>u-blox Bootloader</b>		
<b>Subtitle</b>			
<b>Document type</b>	Protocol Specification		
<b>Document number</b>	UBX-17065404		
<b>Revision and date</b>	R01	18-Jun-2019	
<b>Disclosure Restriction</b>			

This document applies to the following products:

<b>Product name</b>	<b>Type number</b>	<b>u-connectXpress Software version</b>	<b>PCN reference</b>
ODIN-W260	All	All	
ODIN-W262	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-W131	All	All	
NINA-W132	All	All	
NINA-B311	All	All	
NINA-B312	All	All	
ANNA-B112	All	All	
NINA-B221	All	All	
NINA-B222	All	All	
NINA-W151	All	All	
NINA-W152	All	All	

u-blox or third parties may hold intellectual property rights in the products, names, logos and designs included in this document. Copying, reproduction, modification or disclosure to third parties of this document or any part thereof is only permitted with the express written permission of u-blox.

The information contained herein is provided "as is" and u-blox assumes no liability for its use. No warranty, either express or implied, is given, including but not limited to, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by u-blox at any time without notice. For the most recent documents, visit [www.u-blox.com](http://www.u-blox.com).

Copyright © u-blox AG.

# Contents

<b>Document Information</b> .....	<b>2</b>
<b>Contents</b> .....	<b>3</b>
<b>1 Introduction</b> .....	<b>4</b>
<b>2 General commands</b> .....	<b>5</b>
2.1 Help .....	5
2.2 Device Info .....	5
2.3 Serial Baud Rate .....	5
2.4 Reset Module .....	5
2.5 Dump Flash memory .....	6
2.6 Erase Flash memory .....	6
2.7 Boot Image.....	6
2.8 Download binary image.....	7
<b>3 Secure boot commands</b> .....	<b>8</b>
3.1 Boot Image.....	8
3.2 Download binary image.....	8
3.3 Store Image Signature .....	9
3.4 Set Startup Firmware .....	9
3.5 Dump hash of memory.....	9
3.6 List all images .....	9
<b>4 Miscellaneous commands</b> .....	<b>10</b>
4.1 CRC check.....	10
<b>5 Software update examples</b> .....	<b>11</b>
5.1 ODIN-W2 .....	11
5.2 NINA-B1 and ANNA-B112 .....	11
5.3 NINA-B3 .....	11
5.4 NINA-W13-SW1.0.0 .....	12
5.5 NINA-B2, NINA-W15, and NINA-W13 from v2.0.0 .....	12
<b>Related documents</b> .....	<b>13</b>
<b>Revision history</b> .....	<b>13</b>
<b>Contact</b> .....	<b>14</b>

# 1 Introduction

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

Section 5 contains a few examples of how to perform software update on the most common u-blox short range stand-alone modules.

## 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 boot loader help menu.
Response	Description
<productname> boot loader <bootversion> u-blox All parameters in HEX format <availableoptions>	Successful response.
OK	

### 2.2 Device Info

Command	Description
l	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 Acceptable values: 2580, 4B00, 9600, 1C200, 38400, 70800, E1000 <b>Note:</b> ODIN-W26 does not accept 0xE1000 <b>Note:</b> NINA-B1 Software version 4.0.0 and ANNA-B1 12 support only 1C200
Response	Description
OK	Successful response.
ERROR	Error response.

### 2.4 Reset Module

Command	Description
q	Reset the module.
Response	Description
>	<b>Note:</b> OK will NOT be obtained. Module will reset upon success. If no valid connectivity software is configured, a new boot loader prompt will be obtained. If a valid connectivity software is available, the boot loader 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. <b>Note:</b> 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. <b>Note:</b> 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. <b>Note:</b> 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. <b>Note:</b> 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. <b>Note:</b> This information is usually available in the configuration.json file of every software release.
Response	Description
ERROR	Error response.
	<b>Note:</b> OK will NOT be obtained upon Success. If a valid connectivity software is available, the boot loader 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. <b>Note:</b> This information is usually available in the configuration.json file of every software release.
Response	Description
CCCCC.... OK	Successful response.
ERROR	Error response.

## 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-B1 12.

### 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. <b>Note:</b> This information is usually available in the configuration.json file of every software release.
Response	Description
ERROR	Error response.  <b>Note:</b> OK will NOT be obtained upon Success. If a valid connectivity software is available, the boot loader 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. <b>Note:</b> 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
CCCCCC.... 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. <b>Note:</b> 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. <b>Note:</b> 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.
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. <b>Note:</b> 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	Successful write response
Image_name yyyy	
Image_addr FFFFF	
.....	
.....	
OK	

## 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 <b>Note:</b> This command is applicable only for NINA-B1 and ANNA-B112. <b>Note:</b> 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 <b>Note:</b> 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 NINA-B3

NINA-B3 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 z6V5hMPfsspfnayqMTac604pnF++Rv1cGT//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 1/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.

```
> x 13000
CCCCCCC.....
OK
> s 0 p/pfnaYqMTac604pnF++Rv1cas342daGT//UdHZsEe2JUj4+dqtq/g==
OK
> x 20000 A6170 NINA-W1-FIRMWARE rwx 0
CCCCCCC.....
OK
> 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++Rv1cas342daGT//UdHZsEe2JUj4+dqtq/g==
OK
> x 20000 A6170 FIRMWARE rwx 0
CCCCCCC.....
OK
> b 0
+STARTUP
```

## Related documents

- [1] u-connect AT Commands Manual, Document Number [UBX-14044127](#)
- [2] ODIN-W2 System Integration Manual, Document Number [UBX-14040040](#)
- [3] NINA-B1 System Integration Manual, Document Number [UBX-15026175](#)
- [4] ANNA-B112 System Integration Manual, Document Number [UBX-18009821](#)
- [5] NINA-W1 System Integration Manual, Document Number [UBX-17005730](#)
- [6] NINA-B3 System Integration Manual, Document Number [UBX-17056748](#)

 For regular updates to u-blox documentation and to receive product change notifications, register on our homepage ([www.u-blox.com](http://www.u-blox.com)).

## Revision history

Revision	Date	Name	Comments
R01	18-Jun-2019	hvig, lhau, kgom	Initial release.

# Contact

For complete contact information, visit us at [www.u-blox.com](http://www.u-blox.com).

## u-blox Offices

### North, Central and South America

#### u-blox America, Inc.

Phone: +1 703 483 3180  
E-mail: [info\\_us@u-blox.com](mailto:info_us@u-blox.com)

#### Regional Office West Coast:

Phone: +1 408 573 3640  
E-mail: [info\\_us@u-blox.com](mailto:info_us@u-blox.com)

#### Technical Support:

Phone: +1 703 483 3185  
E-mail: [support@u-blox.com](mailto:support@u-blox.com)

### Headquarters

#### Europe, Middle East, Africa

#### u-blox AG

Phone: +41 44 722 74 44  
E-mail: [info@u-blox.com](mailto:info@u-blox.com)  
Support: [support@u-blox.com](mailto:support@u-blox.com)

### Asia, Australia, Pacific

#### u-blox Singapore Pte. Ltd.

Phone: +65 6734 3811  
E-mail: [info\\_ap@u-blox.com](mailto:info_ap@u-blox.com)  
Support: [support\\_ap@u-blox.com](mailto:support_ap@u-blox.com)

#### Regional Office Australia:

Phone: +61 2 8448 2016  
E-mail: [info\\_anz@u-blox.com](mailto:info_anz@u-blox.com)  
Support: [support\\_ap@u-blox.com](mailto:support_ap@u-blox.com)

#### Regional Office China (Beijing):

Phone: +86 10 68 133 545  
E-mail: [info\\_cn@u-blox.com](mailto:info_cn@u-blox.com)  
Support: [support\\_cn@u-blox.com](mailto:support_cn@u-blox.com)

#### Regional Office China (Chongqing):

Phone: +86 23 6815 1588  
E-mail: [info\\_cn@u-blox.com](mailto:info_cn@u-blox.com)  
Support: [support\\_cn@u-blox.com](mailto:support_cn@u-blox.com)

#### Regional Office China (Shanghai):

Phone: +86 21 6090 4832  
E-mail: [info\\_cn@u-blox.com](mailto:info_cn@u-blox.com)  
Support: [support\\_cn@u-blox.com](mailto:support_cn@u-blox.com)

#### Regional Office China (Shenzhen):

Phone: +86 755 8627 1083  
E-mail: [info\\_cn@u-blox.com](mailto:info_cn@u-blox.com)  
Support: [support\\_cn@u-blox.com](mailto:support_cn@u-blox.com)

#### Regional Office India:

Phone: +91 80 405 092 00  
E-mail: [info\\_in@u-blox.com](mailto:info_in@u-blox.com)  
Support: [support\\_in@u-blox.com](mailto:support_in@u-blox.com)

#### Regional Office Japan (Osaka):

Phone: +81 6 6941 3660  
E-mail: [info\\_jp@u-blox.com](mailto:info_jp@u-blox.com)  
Support: [support\\_jp@u-blox.com](mailto:support_jp@u-blox.com)

#### Regional Office Japan (Tokyo):

Phone: +81 3 5775 3850  
E-mail: [info\\_jp@u-blox.com](mailto:info_jp@u-blox.com)  
Support: [support\\_jp@u-blox.com](mailto:support_jp@u-blox.com)

#### Regional Office Korea:

Phone: +82 2 542 0861  
E-mail: [info\\_kr@u-blox.com](mailto:info_kr@u-blox.com)  
Support: [support\\_kr@u-blox.com](mailto:support_kr@u-blox.com)

#### Regional Office Taiwan:

Phone: +886 2 2657 1090  
E-mail: [info\\_tw@u-blox.com](mailto:info_tw@u-blox.com)  
Support: [support\\_tw@u-blox.com](mailto:support_tw@u-blox.com)