

# Release Notes

<b>Topic :</b>	<b>GNSS Firmware 2.01 for u-blox M8 - Public</b>
	UBX-13004697-R3
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<b>1</b>	<b>General Information.....</b>	<b>3</b>
1.1	Released firmware images .....	3
1.2	Released documentation .....	3
1.3	Released software tools .....	3
1.3.1	u-center .....	3
1.3.2	FW update utility .....	3
1.3.3	USB driver .....	3
1.3.4	USB identification .....	3
<b>2</b>	<b>New Features.....</b>	<b>4</b>
2.1	Concurrent GNSS configuration.....	4
2.2	BeiDou .....	4
2.3	Multiple GNSS Assistance .....	4
2.4	Odometer and Low-Speed COG Filter.....	4
2.5	NMEA.....	5
2.5.1	Implementation .....	5
2.5.2	NMEA talker identifiers.....	5
2.5.3	Save on shutdown.....	5
2.6	New Protocol Messages .....	6
2.7	Production Testing .....	6
<b>3</b>	<b>Multi GNSS Operation.....</b>	<b>6</b>
3.1	Concurrent GNSS support .....	6
3.2	GNSS Time .....	6
3.2.1	GNSS time systems .....	6
3.2.2	Time Pulse .....	7
3.3	Coordinate frames.....	7
3.4	NMEA/UBX Satellite Identifiers.....	7
<b>4</b>	<b>Improvements and changes .....</b>	<b>7</b>
4.1	Oscillator support .....	7
4.2	Flash support .....	7
4.3	AssistNow Autonomous .....	8
4.4	Static hold distance threshold .....	8
4.4.1	Navigation channels .....	8
4.5	Logging .....	8

4.6	Protocol Changes .....	8
4.7	Changed firmware defaults .....	9
<b>5</b>	<b>Known Limitations.....</b>	<b>9</b>
5.1	Removed features.....	9
5.1.1	ALP support dropped .....	9
5.1.2	Removed protocol messages .....	9
5.2	Known issues.....	9
5.2.1	BeiDou ICD ambiguities.....	9
5.2.2	Warm start search strategy.....	9
5.2.3	Time pulse longer than 2.7mS.....	10
5.2.4	No exact UTC with SBAS enabled.....	10
5.2.5	False Error messages reported in SafeBoot.....	10

# 1 General Information

This firmware version 2.01 release is for UBX-M8030 products.

This is the standard firmware for the UBX-M8030 chip and contains no product variants. It covers the changes of the u-blox M8 firmware 2.01 compared to u-blox 6/7 firmware 1.01.

## 1.1 Released firmware images

**Supported product variants:** none.

### ROM image for u-blox M8

HW ID String: HW UBX-M80xx

FW ID String: ROM CORE 2.01 (75331) Oct 29 2013 13:28:17

### Flash image for u-blox M8

File: UBLOX\_M8\_201.89cc4f1cd4312a0ac1b56c790f7c1622.bin

FW ID String: EXT CORE 2.01 (75350) Oct 29 2013 16:15:41

Supports ROM base: 0.22 and 2.01

## 1.2 Released documentation

u-blox M8 Receiver Description including Protocol specifications:

File	Audience	Content
UBX-13003221	Public	u-blox M8 Receiver Description including Protocol specifications
UBX-13002887	Confidential (NDA required)	u-blox M8 Receiver Description including Protocol specifications

## 1.3 Released software tools

### 1.3.1 u-center

A new u-center version 8.01 has been released. All new messages of FW 2.01 are supported.

### 1.3.2 FW update utility

The firmware update utility v1.8.0.1 supports this product.

### 1.3.3 USB driver

Drivers are supported for Windows Vista and on-ward:

Windows CDC-ACM driver version 1.2.0.8

Windows Sensor driver: 2.1.0.4

### 1.3.4 USB identification

Vendor ID: 0x1546

Product ID: 0x01A8

Driver String: u-blox GNSS receiver

## 2 New Features

In a significant change from previous firmware, this firmware supports parallel operation of any two of the supported GNSS systems. It also supports BeiDou for the first time. The table below shows an overview of the features available in each system. The default configuration is GPS, SBAS, QZSS & GLONASS

<i>GNSS combination</i>	<i>GPS, SBAS, QZSS &amp; GLONASS</i>	<i>GPS, SBAS, QZSS &amp; BeiDou</i>	<i>BeiDou &amp; GLONASS</i>	<i>GPS</i>	<i>BeiDou</i>	<i>GLONASS</i>
<b>PSM</b>	Not Supported	Not Supported	Not Supported	Supported	Not Supported	Not Supported
<b>AssistNow online</b>	Supported	GPS & QZSS only	GLONASS only	Supported	Not Supported	Supported
<b>AssistNow offline</b>	Supported	GPS & QZSS only	GLONASS only	Supported	Not Supported	Supported
<b>AssistNow autonomous</b>	Supported	GPS & QZSS only	GLONASS only	Supported	Not Supported	Supported
<b>RTCM</b>	Supported (GPS only)	Supported (GPS only)	Not Supported	Supported	Not Supported	Not Supported

The following features are supported in all GNSS configurations:

- Time Pulse
- Weak Signal Tracking
- Interference Suppression
- Logging

### 2.1 Concurrent GNSS configuration

The message UBX-CFG-GNSS allows switching on and off the supported GNSS. In order to configure system specific parameters, use UBX-CFG-SBAS, UBX-CFG-QZSS, UBX-CFG-BDS or UBX-CFG-GLO (only UBX-CFG-SBAS is a public message). **The default configuration is GPS, SBAS, QZSS & GLONASS.**

### 2.2 BeiDou

Support for the Chinese BeiDou system has been added. The B1I signal with D1 and D2 are used for navigation. Use of BeiDou signals is disabled by default and can be enabled using the UBX-CFG-GNSS message. It is not possible to activate Power Save Mode if BeiDou is enabled.

### 2.3 Multiple GNSS Assistance

The new Multiple GNSS Assistance feature adds support for assistance data for GNSS other than just GPS. Most of the previous GPS-only interfaces (UBX-AID-\* messages) are still present in this firmware but should not be used anymore for new designs. Instead a new message class (UBX-MGA) has been added that provides new, future-proof, and multi-GNSS capable interfaces for assistance data.

Please refer to the "Multiple GNSS Assistance (MGA)" chapter in the Receiver description and Protocol specification document for more details.

### 2.4 Odometer and Low-Speed COG Filter

The new odometer engine computes the traveled distance since last reset together with an accuracy estimate (1-sigma). A total distance value is maintained and saved into BBR, and can be reset by a receiver cold-start.

These three odometer outputs can be retrieved from the UBX-NAV-ODO message. The odometer engine can be configured via the UBX-CFG-ODO message which allows three profiles: "running", "cycling" and "car". Additionally, a velocity and heading low-pass filter, as well as a low-speed COG filter have been added. This enables COG computation at very low speeds can be activated and setup in UBX-CFG-ODO.

## 2.5 NMEA

With FW2.01 there are four NMEA standards supported. **The default NMEA version is 4.0.** Alternatively versions 4.1, 2.3, and 2.1 can be enabled.

### 2.5.1 Implementation

For FW2.01 the following has been implemented:

- The svld numbering as in the table in section 3.4.
- Support for NMEA 4.0 (Note: implementation is exactly the same as NMEA 2.3)
- No additional numbering options
- BeiDou information will be output in NMEA 4.x strict (even though this is not yet supported by NMEA)
- FW 2.01 defaults to:
  - NMEA 4.0
  - Strict svld numbering

### 2.5.2 NMEA talker identifiers

One of the ways the NMEA standard differentiates between GNSS systems is by using a two-letter message identifier, the "Talker ID". The specific Talker ID used by a u-blox receiver will depend on the device model and system configuration. The table below shows the Talker ID that will be used for various GNSS configurations.

Configured GNSS	Talker ID
GPS, SBAS, QZSS	GP
GLONASS	GL
BeiDou	GB (can be changed via UBX-CFG-NMEA)
Any combination of multiple GNSS	GN

As the default GNSS configuration for u-blox M8 is GPS+SBAS+QZSS+GLO, the default Talker ID is GN.

### 2.5.3 Save on shutdown

This feature is designed to emulate the presence of the backup battery even if it is not present.

The host can issue the save on shutdown command before switching off the device supply; this will save the key contents of the BBR memory to the external Flash memory. This data can then be restored on power-up.

## 2.6 New Protocol Messages

Message	Remark
UBX-CFG-ODO	Configuration of odometer support
UBX-CFG-PWR	Power mode configuration
UBX-LOG-RETRIEVEPOSEXTRA	Extra position data returned to host
UBX-MGA-ACK	MGA message acknowledge
UBX-MGA-ANO	MGA AssistNow Offline
UBX-MGA-DBD	MGA database polling/aiding
UBX-MGA-FLASH	MGA flash storage access
UBX-MGA-GLO	MGA GLONASS aiding
UBX-MGA-GPS	MGA GPS aiding
UBX-MGA-INI	MGA Initial data aiding (position, time)
UBX-MGA-QZSS	MGA QZSS aiding
UBX-MON-GNSS	Multi GNSS support information
UBX-MON-PATCH	Reports the IDs of firmware patches
UBX-NAV-ODO	Odometer data output
UBX-NAV-ORB	Satellite orbit information
UBX-NAV-RESETO	Odometer reset
UBX-NAV-SAT	Satellites in view
UBX-UDP-SOS	Save to BBR to Flash on shutdown
NMEA-Standard-GBQ	Message query
NMEA-Standard-VLW	Dual ground/water distance

## 2.7 Production Testing

The production testing messages have been upgraded with previous messages (PT) being replaced with new multi GNSS messages (PT2). Details of these are available under NDA.

## 3 Multi GNSS Operation

### 3.1 Concurrent GNSS support

It is possible to use up to two of the GPS, GLONASS & Beidou GNSS systems concurrently. Additionally, if the GPS band is enabled, also SBAS and QZSS can be enabled.

### 3.2 GNSS Time

#### 3.2.1 GNSS time systems

The GNSS are referenced to different time systems. Additionally the GNSS time systems are referenced to different realizations of UTC, for instance GPS uses USNO and GLONASS uses SU. FW 2.01 chooses the reference time system for the navigation solution autonomously based on signal availability and bases reported

UTC on this time source. Fortunately, the difference between these UTC realizations should be very small. UBX-NAV-TIMEUTC contains a new field *utcStandard*, which identifies the currently referenced UTC.

For the legacy UBX messages outputting GPS time references, the internal time is converted to GPS time as accurately as possible. New multi-GNSS messages use UTC as time reference.

On startup there may be a lack of knowledge of leap seconds and inter-GNSS time offsets, until this knowledge is acquired from the GNSS systems, time may be wrong with several seconds – this is corrected as soon as the information is received from the GNSS.

For further information, please refer to the u-blox M8 protocol specification and receiver description document.

### 3.2.2 Time Pulse

In FW2.01 the time pulse is aligned to UTC by default. As the GNSS are referenced to different UTC realizations, small discontinuities might be experienced when the internal reference time is switched. Time jumps may also occur when the receiver obtains new information on GNSS to UTC time offsets.

## 3.3 Coordinate frames

GPS, GLONASS and BeiDou employ different coordinate frames to express their satellite positions (WGS84, PZ90.02, CGCS2000). However, all output in NMEA and UBX is related to WGS84, regardless of the GNSS used.

## 3.4 NMEA/UBX Satellite Identifiers

A summary of all the SV numbering schemes is provided in the following table.

GNSS Type	SV range	UBX gnssId:svId	UBX svId	NMEA 2.X (strict)	NMEA 2.X (extended)	NMEA 4.X (strict)	NMEA 4.X (extended)
GPS	G1-G32	0:1-32	1-32	1-32	1-32	1-32	1-32
SBAS	S120-S158	1:120-158	120-158	33-64	33-64,152-158	33-64	33-64,152-158
BeiDou	B1-B37	3:1-37	159-163,33-64	-	401-437	1-37	1-37
QZSS	Q1-Q5	5:1-5	193-197	-	193-197	-	193-197
GLONASS	R1-R32, R?	6:1-32, 6:255	65-96, 255	65-96, null	65-96, null	65-96, null	65-96, null

## 4 Improvements and changes

This chapter describes the improvements and changes in GNSS firmware 2.01 compared to earlier u-blox firmware versions.

### 4.1 Oscillator support

FW2.01 supports crystals with a 7pF capacitance. Initial offset calibration is possible.

The algorithm to operate crystals at their optimum drive level has been improved.

### 4.2 Flash support

Support for the deep sleep functionality provided by some flashes has been added. This means that when entering low power modes the flash is set into a low power mode as well to conserve energy.

### 4.3 AssistNow Autonomous

The AssistNow Autonomous feature adds support for GLONASS orbit prediction when u-blox M8 is connected to a suitable flash memory. Due to the nature of the GLONASS broadcast ephemerides it will only predict GLONASS orbits once it has observed a satellite for more than four hours.

For GPS satellites the prediction quality has been improved if u-blox M8 is connected to a suitable flash memory.

### 4.4 Static hold distance threshold

A configuration option has been added to UBX-CFG-NAV5 to allow for configuration of the maximum distance after which the static hold mode is quit.

#### 4.4.1 Navigation channels

To ensure the best power performance trade-off, the navigation solution in FW2.01 selects measurement from only the best 20 satellites – even if more than 20 satellites are being tracked.

### 4.5 Logging

The logging feature has been extended to include logging of odometer values.

### 4.6 Protocol Changes

For new messages, see section 2.6, for removed messages, see section 5.1.2.

The following table states significant changes apart from merely added or removed messages.

This section just lists the notable changes, for details please refer to the protocol specification.

Message	Remark	Backwards compatible
UBX-CFG-NAV5	Added a parameter for configuration of the maximum static hold distance	Yes
UBX-CFG-NMEA	NMEA protocol version adjustments, BeiDou support	Yes
UBX-CFG-ITFM	Added option to enable scanning on auxiliary RF channel	Yes
UBX-NAV-AOPSTATUS	Satellite availability masks are not filled in anymore	No
UBX-NAV-PVT	Added vehicle heading	No
UBX-NAV-TIMEUTC	Added the UTC standard identifier	Yes
UBX-AID-AOP	Multi-GNSS support	No



## 4.7 Changed firmware defaults

This section just lists the notable changes, for details please refer to the protocol specification.

Message	Remark
UBX-CFG-GNSS	GPS+SBAS+QZSS+GLO are enabled by default
UBX-CFG-NAVX5	maxSVs 20 for u-blox M8, week number rollover adjusted minCNO set to 6dbHz
UBX-CFG-NMEA	Defaults to NMEA 4.0, strict numbering
UBX-CFG-SBAS	The SBAS PRNs searched by default adapted to current constellation (removed GAGAN and SDCM from scan list).
UBX-CFG_TP5	Time pulse referenced to UTC by default

## 5 Known Limitations

### 5.1 Removed features

#### 5.1.1 ALP support dropped

Support for ALP (legacy AssistNow Offline format) has been dropped from FW2.01. AssistNow Offline is using the new MGA functionality (see section 2.3).

#### 5.1.2 Removed protocol messages

Message	Remark
UBX-AID-ALP	Replaced by MGA aiding messages
UBX-AID-ALPSRV	Replaced by MGA aiding messages
UBX-AID-DATA	Replaced by UBX-MGA-DBD
UBX-AID-REQ	No longer supported

### 5.2 Known issues

#### 5.2.1 BeiDou ICD ambiguities

As the BDS-SIS-ICD-B11-1.0 document is not clear in several points, some assumptions have been made in the implementation in FW2.01. The areas affected are:

- Ephemeris collection
- Almanac handling
- Ephemeris validity
- UTC polynomial

For further information please refer to the u-blox M8 protocol specification and receiver description document.

#### 5.2.2 Warm start search strategy

The warm start algorithm is not optimal when the almanac contains very few satellites.

### 5.2.3 Time pulse longer than 2.7ms

If the time pulse high period is greater than 2.7ms there is a risk of time pulses high occasionally being shortened by 1 ms, the frequency is unaffected as the period between rising edges remains correct.

In extremely rare cases additional pulses can also be generated.

It is therefore advisable to avoid time pulses with an up period of greater than 2.7 ms.

### 5.2.4 No exact UTC with SBAS enabled

It is not recommended to use SBAS in the solution for products requiring accurate UTC time.

### 5.2.5 False Error messages reported in SafeBoot

The following error messages (or similar) may be reported when starting up in SafeBoot mode:

```
$GNTXT,01,01,00,XTO frequency check failed during startup*55
```

```
$GNTXT,01,01,00,XTO drive level check failed*6D
```

```
$GNTXT,01,01,00,XTO initialisation fault!*40
```

These error messages should be ignored, as they are output in error.