

Release note

Topic	SPG 4.04 – firmware for u-blox M9 standard precision products
	UBX-20036165 - R02 C1-Public
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1 General information

1.1 Scope

This release note applies to the M9 chipset and module firmware version SPG 4.04.

The document covers the changes in the firmware for the M9 chipset and module products compared to M8 firmware version 3.01.

1.2 Related documentation

- [1] NEO-M9N Interface description, [UBX-19035940](#)
- [2] NEO-M9N Integration manual, [UBX-19014286](#)
- [3] Windows drivers application note, [UBX-19005821](#)
- [4] u-center v21.05 Release notes, [UBX-21022937](#)
- [5] XPLR-M9 Explorer kit user guide [UBX-19041842](#)

2 Released firmware image

2.1 External SPG 4.04 image

Released external firmware image for u-blox M9 products	
File	JU_EXT_404.907640e53126add7de4708d754b575ef.bin
Firmware version	EXT CORE 4.04 FWVER=SPG 4.04
Protocol version	PROTVER=32.01
ROM base support	Boot ROM 1.02

The image can be used as external image stored on flash or downloaded to the on-device RAM at every startup.

2.2 ROM SPG 4.04 image

Released ROM firmware image for u-blox M9 products	
Firmware version	ROM CORE 4.04 FWVER=SPG 4.04
Protocol version	PROTVER=32.01
ROM base support	n.a.

2.3 Released software

2.3.1 u-center

u-blox recommends using u-center GNSS evaluation software version 21.05 (or later) with the released product.

Note that u-center support has some limitations; see section 6.6 for details.

u-center GNSS evaluation software	
File	u-center_v21.05.exe
MD5 sum	3a78d84e606b2d254e78a59b6f6288a1

2.3.2 USB driver

USB driver support for Windows 7 and Windows 8:

- u-blox GNSS Standard Driver for Windows CDC-ACM: version 1.2.0.8
Included in u-center installer.

USB driver support for Windows 10 onward:

- Windows inbox standard CDC-ACM: will automatically install

More information about windows drivers can be found in [3].

2.4 Identification

2.4.1 USB identification

USB identification of u-blox M9 products	
Vendor ID	0x1546
Vendor string	u-blox AG - www.u-blox.com
Product ID	0x01A9
Driver string	u-blox GNSS receiver

3 Features

3.1 Supported GNSS

The supported navigation satellite systems are divided into two groups: major GNSS and augmentation systems. Major GNSS are GPS, GLONASS, BeiDou and Galileo; augmentation systems are SBAS and QZSS.

Any combination of major GNSS is supported. The augmentation systems are only supported in combination with GPS.

3.2 Feature support

The table below shows an overview of the features available in the firmware depending on the major GNSS configuration.

Feature	Comment
Time pulse	All GNSS configurations supported
PSM	All GNSS configurations supported
AssistNow Online	Supported only for GPS, BeiDou, GLONASS, Galileo and QZSS, not for SBAS
AssistNow Offline	Supported only for GPS and GLONASS
AssistNow Autonomous	Supported only for GPS, BeiDou, GLONASS and Galileo
Weak signal tracking	All GNSS configurations supported
RTCM	All GNSS configurations supported
Interference suppression	All GNSS configurations supported
Logging and batching	All GNSS configurations supported
Unprocessed navigation data	All GNSS configurations supported

3.3 High update rate

The receiver can be configured to produce navigation solutions at up to 25 Hz.

3.4 Improved BeiDou and Galileo startup sensitivity

The cold start acquisition sensitivity for BeiDou and Galileo is improved by 2 dB over M8 receivers. Hot start sensitivity is improved by 4 dB for BeiDou and 3 dB for Galileo.

3.5 QZSS L1S support

The receiver can use corrections provided via the QZSS L1S signal.

Users of the receiver can access the Disaster and Crisis Management report by enabling UBXRXM-SFRBX and parsing it themselves. There is no dedicated output message for this purpose.

3.6 BDSBAS L1 C/A support

The receiver is prepared to use corrections for GPS L1 C/A provided via BDSBAS L1 signal (Oct/2020).

These satellites are not enabled by default so the customer will need to do this explicitly.

3.7 Firmware update without flash memory

It is possible to download the firmware from the host into the RAM of the receiver chip. This offers the possibility of saving BOM by eliminating the need for a flash memory device.

3.8 RF spectrum view

Customers can use the UBX-MON-SPAN message to analyze their design and find interference signals via a simple spectrum analyzer implementation.

3.9 AssistNow Offline and Autonomous

The Offline and Autonomous variants of the u-blox AssistNow services now work alongside each other. The receiver intelligently selects the most reliable source of orbit prediction, eliminating the need for the host to predict access to network and select which system to enable in advance.

Assist Autonomous is enabled by default in SPG 4.04.

3.10 Secure boot

The receiver will only run firmware signed by u-blox. This helps against attacks on the critical systems.

3.11 Authentication of data output

M9 receivers can authenticate all output data using asymmetric key-based cryptographic signatures. Users need to provide a private/public key pair for this communication.

3.12 Antenna supervisor with reduced external circuitry

The firmware supports analog current measurement based-antenna supervisors, offering a trade-off between cheaper supervisor circuits and faster reaction time.

3.13 Location batching

The firmware supports storage of navigation solutions for up to 5 minutes within the receiver even without an external flash. This can be used to reduce system power consumption by allowing the application processor to stay in low-power mode for an extended time.

3.14 Differential GNSS support via RTCM 3.3

With RTCM 3.3 code differential corrections users can achieve improved position accuracy. RTCM 3.3 supports corrections for all GNSS signals. This firmware does not support RTK operation mode.

4 Dropped or reduced features

This section lists features that have been dropped or reduced since M8 FW 3.01.

4.1 Power save mode configuration

The range of configuration options has been reduced compared to earlier standard precision products:

- 4 Hz cyclic tracking mode: Users are recommended to use power save modes with longer periods, or continuous operation.
- Separate update rate in continuous and power-optimized tracking: M8 users needed to be aware of the different effects of UBX-CFG-RATE and UBX-CFG-PM2 in different phases of the receiver’s operation when configured to cyclic tracking. Now there is only one setting to configure the update rate (via the CFG-RATE-* group).

4.2 Time pulse quantization error

This firmware does not support the output of “quantization error” via UBX-TIM-TP2. u-blox recommends using dedicated timing products for applications that require precise time information.

4.3 IMES support

This firmware does not support the QZSS Indoor Messaging System.

5 Message interface

5.1 NMEA

5.1.1 Overview

Four NMEA standards are supported. The default NMEA version is 4.10. Alternatively, versions 4.0, 2.3, and 2.1 can be enabled. The details on the NMEA talker identifier can be found in the Interface description [1].

5.1.2 New NMEA messages

Message	Audience	Description / Comment
NMEA-Standard-RLM	PUB	Return link message

5.1.3 Modified NMEA messages

This table contains a list of messages that have been modified compared to messages also available in protocol version 18.00.

Message	Audience	Description / Comment
NMEA-Standard-GAQ	PUB	It is now possible to poll a standard message if the current Talker ID is GA.
NMEA-Standard-DTM	PUB	The message now supports the display of PZ90 datum (as P90).
NMEA-Standard-GST	PUB	Support the output of the error ellipse as defined by its semi-major and semi-minor axis as well as its orientation.
NMEA-Standard-GSV	PUB	Various implementation errors fixed, e.g. null fields, range of azimuth angle [0..359], etc.
NMEA-Standard-GRS	PUB	Various implementation errors fixed, e.g. null fields, residual ordering.
NMEA-Standard-VLW	PUB	The fields that were only introduced in NMEA version 4.00 have been removed from this message for version 2.30.

5.2 UBX

5.2.1 Overview

This firmware supports UBX protocol version 32.01.

5.2.2 New UBX messages

Message	Audience	Description / Comment
UBX-CFG-VALDEL	PUB	Part of the new configuration interface
UBX-CFG-VALGET	PUB	Part of the new configuration interface
UBX-CFG-VALSET	PUB	Part of the new configuration interface
UBX-LOG-BATCH	PUB	Data batching output data
UBX-LOG-RETRIEVEBATCH	PUB	Data batching request for retrieval
UBX-MON-BATCH	PUB	Data batching state monitoring
UBX-MON-HW3	PUB	Replaces and extends part of UBX-MON-HW and UBX-MON-HW2 functionality
UBX-MON-RF	PUB	Replaces and extends part of UBX-MON-HW and UBX-MON-HW2 functionality
UBX-MON-SPAN	PUB	Crude spectrum analyzer functionality
UBX-NAV-SAT	PUB	Replaces UBX-NAV-SVININFO, contains satellite information but does not contain signal specific information
UBX-NAV-SIG	PUB	Replaces UBX-NAV-SVININFO, contains signal specific information
UBX-NAV-TIMEQZSS	PUB	QZSS time information, QZSS time is estimated when QZSS L1S is used in navigation
UBX-SEC-SESSID	PUB	Session ID for message authentication when locking configuration

5.2.3 Modified UBX messages

This table contains a list of messages that have been modified compared to messages also available in protocol version 27.11.

Message	Audience	Description / Comment
UBX-TIM-TP	PUB	Added "qErrInvalid" flag to indicate when quantization error is not provided

5.2.4 Deprecated UBX messages

Message	Audience	Description / Comment
UBX-CFG-ANT	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-BATCH	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-DAT	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-DGNSS	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-GEOFENCE	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-INF	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-ITFM	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-LOGFILTER	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹

¹ See Legacy UBX message field reference in the Interface description [1].

Message	Audience	Description / Comment
UBX-CFG-MSG	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-NAV5	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-NAVX5	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-NMEA	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-ODO	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-PM2	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-PMS	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-PRT	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-RATE	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-RINV	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-RXM	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-SBAS	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-TP5	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-CFG-USB	PUB	Use UBX-CFG-VAL[SET DEL GET] instead ¹
UBX-MON-HW	PUB	Use UBX-MON-HW3 and UBX-MON-RF as a replacement
UBX-MON-HW2	PUB	Use UBX-MON-HW3 and UBX-MON-RF as a replacement

5.2.5 Removed UBX messages

Message	Audience	Description / Comment
UBX-AID-*	PUB	GPS assistance data; use UBX-MGA-* instead
UBX-NAV-SVINFO	PUB	Use UBX-NAV-SAT or UBX-NAV-SIG instead
UBX-NAV-SOL	PUB	Use UBX-NAV-PVT instead
UBX-RXM-IMES	PUB	IMES is not supported in this firmware
UBX-RXM-SVSI	PUB	Use UBX-NAV-ORB instead

5.3 RTCM

5.3.1 Overview

This firmware supports the RTCM3 standard up to version 3.3. It does not support the RTCM2 standard.

5.3.2 New RTCM messages

Message	Audience	Description / Comment
RTCM 3.3 GPS MSMs (1071, 1073-1077)	PUB	GPS observations
RTCM 3.3 GLONASS MSMs (1081, 1083-1087)	PUB	GLONASS observations
RTCM 3.3 Galileo MSMs (1091, 1093-1097)	PUB	Galileo observations
RTCM 3.3 SBAS MSMs (1101, 1103-1107)	PUB	SBAS observations
RTCM 3.3 QZSS MSMs (1111, 1113-1117)	PUB	QZSS observations
RTCM 3.3 BDS MSMs (1121, 1123-1127)	PUB	BeiDou observations
RTCM 3.3 messages 1005 and 1006	PUB	Reference station coordinates

5.3.3 Modified RTCM messages

None

5.3.4 Deprecated RTCM messages

None

5.3.5 Removed RTCM messages

Message	Audience	Description / Comment
RTCM 2.3 type 1 message	PUB	Differential GPS Corrections
RTCM 2.3 type 2 message	PUB	Delta Differential GPS Corrections
RTCM 2.3 type 3 message	PUB	GPS Reference Station Parameters
RTCM 2.3 type 9 message	PUB	GPS Partial Correction Set

5.4 Configuration interface

M9 introduces a new configuration mechanism compared to M8, based on UBX-CFG-VALSET, UBX-CFG-VALDEL and UBX-CFG-VALGET. Refer to the Interface description [1] for a description of this feature and the available settings.

6 Known limitations

The limitations that have been resolved since u-blox M9 firmware SPG 4.00 release are listed first. The remainder of this section then describes the current known limitations.

6.1 Resolved limitations since last release

- Rare watchdog resets causing the receiver to perform a cold start. The consequences are:
 - Position outage until the receiver re-acquires satellites
 - Possibly extended position outage in unfavorable scenarios because the acquisition sensitivity is lower than tracking sensitivity
 - Because the configuration can be saved in flash memory or eFuse, active configuration that was not saved in non-volatile storage such as flash memory or battery-backed RAM might be lost
- Improved USB and I2C interface robustness
- RTC reset mechanism
- NMEA-PUBX messages cannot be polled
- Exception and restart in cyclic tracking
- Galileo time aiding via UBX-MGA-INI-TIME_GNSS is now possible

6.2 System

- Continuous wave jamming indicator in UBX-MON-RF does not consider an internal mitigation mechanism, resulting in a low indicator value despite a strong jammer. When this happens the indicator value may drop or jump suddenly as the mitigation mechanism turns on or off.
- If a new signal configuration (UBX-CFG-GNSS or UBX-CFG-VALSET) is sent to the receiver before it completely starts up its GNSS functionality, it may be acknowledged but not applied immediately.

6.3 Differences between EXT and ROM version

- The ROM image has a default baud rate of 9'600 baud.
- The EXT image has a default baud rate of 38'400 baud.

6.4 Power save mode

- Spoofing detection in cyclic tracking PSM is weaker than in continuous mode.
- CFG-PM-EXTINTWAKE causes the receiver always to stay on after the first assertion, it does not go into backup (off mode) after that even when the pin is de-asserted.

6.5 Navigation

- The receiver does not output time pulses when QZSS SLAS corrections are applied. Customers who want time pulse output need to disable SLAS corrections (this is the default setting).
- The UBX-NAV-SIG message may report the health status of a satellite as unknown while it is in fact unhealthy. This does not affect its use in navigation (unhealthy satellites are omitted correctly) and UBX-NAV-SAT reports the correct status.
- The receiver may output the following error message: “SBAS alc x” where “x” is a number, for example, 8. This happens if an SBAS satellite broadcasts information on more than 5 ionosphere bands. The error message notifies the user that the receiver cannot store all the ionospheric correction data due to internal memory constraints. The receiver will continue operation normally; it will merely ignore ionospheric corrections for the band “x”. All other bands are used as before, and users do not need to do anything about this.
- If an RTCM correction stream contains invalid values for pseudorange, phaserange or phaserange rate, the receiver will interpret the information as unhealthy, but valid correction data. This may lead to position accuracy degradations if multiple satellites are affected over an extended time period.

6.6 Limitations in u-center support

At the time of release u-center support was limited in the following areas:

- Firmware download to RAM via I2C does not work in u-center. Customer shall get in touch with u-blox for support in that case.

Revision history

Revision	Date	Name	Comments
R01	04-Sep-2020	mvet	Initial release
R02	13-Dec-2021	mvet, julu	Updated section 1.2 and section 2.3 (u-center and USB driver), removed irrelevant UBX-CFG-MSG-UBX_NAV_NMI_PORT from section 5.2.2 (New UBX messages), removed UBX-CFG-CFG from section 5.2.4 (Deprecated UBX messages), updated section 6.6.