

Release note

Topic	MDR 2.16 – Updated firmware for NEO-M9V, UBX-M9340-KB, and EVK-M9DR
	UBX-22037070 C1-Public
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1 General information

1.1 Scope

This release note describes the firmware image 1.00 MDR 2.16, designed to run on the following hardware products:

- Module: NEO-M9V
- Chipset: UBX- M9340-KB
- Evaluation kit: EVK-M9DR

1.2 Related documentation

- [1] MDR2.16 Interface description, [UBX-22037308](#)
- [2] NEO-M9V Data sheet, [UBX-21029781](#)
- [3] UBX-M9340-KB Data sheet, UBX-22018191, C2-Restricted
- [4] NEO-M9V Integration manual, [UBX-21029776](#)
- [5] MDR2.10 Release notes, [UBX-22000503](#)

1.3 Software releases

1.3.1 External firmware image

Released firmware image for u-blox M9 products	
Files	UBX_M9_100_MDR216.5a9b4a0783d964d9d87309c681661b2d.bin UBX_M9_100_MDR216_SW_IF.de07e06c95c03047b769af9094e7267f.bin
Firmware version	EXT CORE 1.00 (add159), FWVER=MDR 2.16
Protocol version	PROTVER=35.16
ROM base support	ROM 1.02 - ROM BASE 0x118B2060

2 New and improved features

2.1 New features

- The **odometer feature** known from u-blox M8 generation was **improved and added**.

Refer to [5] for a list of new features that were made available in the previous release.

2.2 Improved features

This release introduces enhancements targeting the overall robustness of the u-blox M9 platform when operating in corner case scenarios. The key improvements to existing features are listed below:

- Enhanced the **dead reckoning (ADR/UDR) performance** by mitigating large position drifts and position jumps in corner case scenarios.
- The **occurrence of position drifts** with UDR were **reduced** in occasions when a power cycle was applied to a static receiver in DR mode after providing GNSS and sensor fusion assistance.
- The **occurrence of position drifts** with UDR were **reduced** in occasions when the vehicle is stopped very slowly.

- A **high noise flag** in `UBX-ESF-STATUS` is delivered when there is high sensor noise while the receiver estimates the vehicle to be static. This flag is helpful to recognize mounting setups with strong mechanical noise, predominantly due to insufficient tightness between the receiver and the vehicle frame.
- Optimized the **advanced calibration handling** operation to mitigate position jumps when restoring `UBX-MGA-SF` after consecutive resets.
- Improved the **directionless odometer mode** when the input wheel tick quantization is very large ($\gg 1$ cm).
- Adapted the **course over ground value** in NMEA-GxRMC message to output values within 0-355.99 range.
- Corrected the **clock solution message** `UBX-NAV-CLOCK` to output updated values after reaching sensor fusion.
- **Driver issues** with TDK IAM 20680 family of IMUs were **fixed**.

Please refer to the integration manual [4] for detailed information regarding these features.

3 Removed features

No feature has been removed in this release. Refer to [5] for a list of features that were removed in the previous release.

4 Known limitations and workarounds

4.1 NMEA standard violations

The NMEA protocol used by u-blox deviates from the standard with own extensions where necessary. These violations are not considered critical for customers.

Workaround: Implement protocol extensions on the host side when these shall be used.

4.2 Time free hotstart with large time offset

This limitation only applies to chip designs using the time free hotstart feature, which helps to speed up the TTFF in designs without RTC.

In rare occasions when in time free hotstart mode, the navigation solution might produce a solution where the time might be off by minutes.

Workaround: The time free hotstart feature can be disabled by configuration: `CFG-NAVSPG-USE_TFH`.

4.3 Position drifts in UDR with strong vibration environment

Position drifts can occur during DR when using the UDR mode and strong vibrations occur. The root cause of strong mechanical vibration is typically related to the vehicle engine (e.g. diesel engine) or to insufficient tightness of the IMU with the vehicle frame. The effect has predominantly been seen with evaluation kits, i.e., with EVK-M9DR, during the product evaluation phase. As mentioned in section 2.2, a new warning flag in `UBX-ESF-STATUS` is delivered to report high sensor noise while the receiver estimates the vehicle to be static. This flag is helpful to recognize mounting setups with insufficient tightness between the receiver and the vehicle frame while GNSS reception is available.

Workaround: When strong vibration is reported, review the installation setup, and improve it. If satisfying performance still cannot be reached, contact your nearest u-blox representative for further support.

4.4 Stuck in DR after tunnel exit

In rare occasions, the receiver stays in the DR mode after tunnel exit for a while (typically up to around 2 minutes) instead of reverting to fusion mode right after receiving the GNSS signals again.

Workaround: None.

4.5 Position drifts with e-scooter dynamic model in UDR mode

When using the e-scooter dynamic model in the UDR mode, static periods sometimes do not get detected in DR epochs, leading to position drifts.

Workaround: Improve the installation of the receiver to reduce vibrations. Alternatively, connect wheel tick or provide speed input to use ADR instead of UDR if possible.

4.6 Carrying e-scooter on a tram might lead to bad performance

This limitation only applies to the e-scooter dynamic model.

Position drifts or jumps might occur when an e-scooter is carried on a tram or train.

Workaround: Implement intelligence on the host side to capture unexpected position changes and disable sensor fusion during such period.

4.7 Incorrect warnings with wheel tick or speed measurements

This limitation only applies to ADR mode.

The receiver might report incorrect warnings seen as “bad measurement” for wheel tick or speed measurements. The receiver performance is not affected during the presence of incorrect warnings.

Workaround: Discard “bad measurement” warnings when no other issue is present.

4.8 Wheel tick is not used for identifying standstill when in uncalibrated status

This limitation only applies to the ADR mode.

In ADR, the wheel tick is used to reliably detect standstill periods. During the calibration phase, when the wheel tick is considered uncalibrated, it is not used for that purpose although it could be used.

5 Message Interface

5.1 UBX

This firmware now supports the **UBX Protocol Version 35.16**. Refer to [1] for details.

5.2 New and modified messages

The following modifications have been made compared to firmware 1.00 MDR 2.10:

5.2.1 New messages

Message	Description / comment
UBX-MON-SYS	Current system performance information, message output rate is configurable with new CFG-MSGOUT-UBX_MON_SYS_* configuration items
UBX-NAV2-SLAS	Support for a new message which outputs status information about SLAS corrections on secondary output. Message output rate configurable with new CFG-MSGOUT-UBX_NAV2_SLAS_* configuration items
UBX-NAV2-TIMEQZSS	Support for new messages which output information about QZSS time in secondary output. Message output rate configurable with CFG-MSGOUT-UBX_NAV2_TIMEQZSS_* configuration items
CFG-SBAS-IGN_HEALTH_FROM_PRNMASK CFG-SBAS-USE_IONOONLY	Ignore the health flag in the PRN mask Configuration to enable use of SBAS ionosphere correction only
CFG-SEC-JAMDET_SENSITIVITY_HI	Enable to increase the sensitivity of jamming detection at the expense of increased false alarm rate

5.2.2 Modified messages

Message	Description / comment
CFG-QZSS-SLAS_MAX_BASELINE	Maximum baseline increased to 350 km

5.2.3 Removed messages

Message	Description / comment
CFG-ITFM-ANTSETTING CFG-ITFM-BBTHRESHOLD CFG-ITFM-CWTHRESHOLD CFG-ITFM-ENABLE CFG-ITFM-ENABLE_AUX	Configuration for legacy interference monitor, this has been replaced with simpler configuration interface

6 Open-Source declaration

This u-blox positioning product described in this release note, comprising the company's proprietary software, does not contain open-source software to declare.

7 Revision history

Revision	Date	Name	Comments
R01	15-Mar-2023	mvet	First official release of MDR 2.16 release notes