Release Notes

Topic **u-blox M8 UDR 1.21 Firmware for UDR products**
UBX-18050702

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1 General Information

This firmware operates with NEO-M8U module and EVA-M8E SiP.

1.1 Scope

This release notes covers the changes of the UDR 1.21 firmware compared to UDR 1.00 firmware version. This release notes should be read in conjunction with the release notes UBX-16009439 for a comprehensive list of changes with respect to earlier versions.

1.2 Released Firmware image

1.2.1 EVA-M8E module Firmware

Image file for -softwrae interfaced sensor data:

`UBX_M8_301_UDR_121_EVA_M8E_SWIF.0ab8ee85ff54e7a3cc7e5a8c992effa4.bin`

Image file pre-configured for directly connected sensor (hardware sensor interface):

`UBX_M8_301_UDR_121_EVA_M8E_HWIF.158df1085ceca5737943a186fcdfeaac.bin`

FW ID String:
```
EXT CORE 3.01 (1ec93f)
FWVER=UDR 1.21
PROTVER=19.20
```
Supports ROM base: 2.01, 3.01

1.2.2 NEO-M8U module Firmware

Image file:

`UBX_M8_301_UDR_121_NEO_M8U.353541159c811435b97d6173f0c32174.bin`

FW ID String:
```
EXT CORE 3.01 (1ec93f)
FWVER=UDR 1.21
PROTVER=19.20
```
Supports ROM base: 2.01, 3.01

1.3 Related documentation

[1] u-blox M8 Specification (UBX-13003221)
[2] Release Notes, GNSS Firmware 3.01 – (UBX-16000319)

1.4 u-center

u-center for Windows v18.06 or later should be used together with this firmware.

1.5 Firmware update tool

The firmware update utility tool v2.01 supports this product.
NOTE: Earlier versions of the firmware update tool will not operate with this release.

1.6 USB drivers

- u-blox GNSS Standard Driver for Windows v1.2.0.8
- u-blox GNSS Sensor Device Driver for Windows v2.40 and later
- u-blox GNSS VCP Device Driver for Windows v3.01

The latest drivers are available from the Product Resources section of the u-blox website - http://www.u-blox.com

1.7 USB identification u-blox M8

Vendor ID: 0x1546
Product ID: 0x01A8
Driver String: u-blox GNSS receiver

1.8 Built-in driver support for directly-connected sensors

This release includes built-in support for the following sensors connected via a 2-wire interface (hardware sensor interface). Additional sensors may be supported on request in the future firmware releases.

Sensor type	Address	Configuration	Notes
Bosch BMI160	0x68	SD0 connected to GND	Connect CSB to VDDIO
Bosch BMI055	0x18 and 0x68	SDO1 and SDO2 connected to GND	PS connected to VDDIO
Bosch SMI130	0x18 and 0x68	SDO1 and SDO2 connected to GND	PS connected to VDDIO
Invensense MPU6515	0x68	ADO/SDO to GND	PS connected to VDDIO
Invensense MPU6500	0x68	ADO/SDO to GND	PS connected to VDDIO
ST LSM6DSL	0x6A	SDO/SA0 to GND	PS connected to VDDIO
ST LSM6DS3	0x6A	SDO/SD0 to GND	PS connected to VDDIO
ST LSM6DS0	0x6A	SDO/SD0 to GND	PS connected to VDDIO

2 New and modified messages

2.1.1 New messages and commands

Message	Audience	Description / Comment
UBX-NAV-SLAS	PUBLIC	This message is SLAS specific. It provides available pseudo range corrections, the location of the selected Ground Monitoring Station (GMS), and the used QZSS SV that broadcasts the corrections. The QZSS disaster and crisis report messages are contained in UBX-RXM-SFRBX but needs to be decoded on customer side.
UBX-CFG-SLAS	PUBLIC	Configuration messages for SLAS support at QZSS satellite system in Japan.

2.1.2 Modified messages and commands

Message	Audience	Description / Comment
UBX-CFG-NAV5	PUBLIC	Model type: Bike mode was added.

3 UDR 1.21

3.1 Introduction

This chapter describes the new UDR features, improvements, changes and bug fixes in this release compared to flash firmware 3.01 UDR 1.00.

The UDR technology brings the following advantages compared to standalone GNSS positioning:

- Improved navigation performance in GNSS-denied conditions: Errors caused by multipath or weak signal conditions are mitigated through the aid brought by the accelerometers and gyroscopes.
- Navigation solution during short GNSS-outages: The newly developed inertial navigation system (INS) bridges short GNSS gaps (typically below 1 minute), which can be caused by tunnels or parking garages.

The UDR navigation performance is better than GNSS only in urban areas but ADR (with speed information from the vehicle) offers the best performance during signal loss. In ADR, the absolute distance information from the vehicle is used to bound integrated drift from inertial sensors. However, u-blox UDR firmware implements an automotive dead reckoning positioning mode that helps bound position and velocity errors without speed or distance information during GNSS outages.

3.2 Configuration and defaults

The following subsections provide information about the default settings and new or notable configuration requirements. (Default settings can be modified using UBX-CFG- messages and then saved to Flash using UBX-CFG-CFG if required after restart.) More details are provided in the receiver description [2].

3.3 Fusion Modes

UDR operates in different modes, which can be monitored by the `fusionMode` field in the UBX-ESF-STATUS message. The following table summarizes the different modes.

Mode	Description	Performed Tasks/Possible Causes	Published Fix Type
Initialization	This phase estimates all unknown parameters required for achieving fusion. Initialization if triggered after first use, a receiver coldstart or an automatic filter reset caused by a failure. Initialization phase requires the vehicle to be subject to some dynamics (left/right turns, stationary periods). `fusionMode=0:INITIALIZING`	• Initialization of IMU sensors (accelerometers and gyroscopes) • Initialization of INS (position, velocity and vehicle attitude)	3D-fix (GNSS)
Fusion	The receiver computes navigation solutions by integrating the IMU sensors with GNSS signals. At the same time, the IMU sensors are permanently calibrated and compensated for errors. `fusionMode=1:FUSION`	• Fine calibration of IMU sensors (accelerometers and gyroscopes) • Fine calibration of INS (position, velocity, attitude errors)	GNSS/DR Fix
Suspended Fusion	Sensor fusion can be temporarily suspended in cases where no fused solution should or can be computed. `fusionMode=2:SUSPENDED`	• IMU error (e.g. missing data) • INS error (e.g. calibration error)	3D-fix (GNSS)
Disabled Fusion	Sensor fusion can be permanently switched-off in cases where recurrent fusion failures happen or user turned-off manually fusion. `fusionMode=3:DISABLED`	• Fatal system failure • Fusion filter turned-off by user (using UBX-CFG-NAVX5 message)	3D-fix (GNSS)

In general, the initialization process must be performed only once until the parameters are automatically stored and kept in the Battery Backed RAM (BBR).

Once initialized and calibrated, the system delivers optimal integrated navigation solutions together with accuracy estimation. The system is able to bridge short GNSS gaps by integrating the inertial observations over time. The system then outputs “DR” solution types together with accuracy estimation.

The inertial sensors used in the UDR technology suffer from bias and scale factor drifts resulting in accumulated errors in positioning. The sensor drift is estimated and compensated continuously in the system but residual uncompensated errors such as due to vibrations, bumps in the road, and fast temperature changes inevitably degrade the dead reckoning performance with time. In such situations, the system recovers quickly once GNSS signals are reacquired.

3.4 GNSS defaults

- The default minimum number of SVs allowed for navigation is set at 5.
- The default maximum number of SVs allowed for navigation is set at 20.
- The default minimum signal power level required for navigation is set at 20 [dB-Hz].
- The default minimum satellite elevation required for navigation is set at 10 [degrees].
- Signal Attenuation Compensation is set to automatic.

3.5 HNR rate pre-configured

The rate for High Navigation Rate solutions is configured by default to 10 Hz in this release (previously 0Hz/disabled). This means that it is no longer necessary to send the HNR configuration message (UBX-CFG-HNR) in addition to individual UBX-CFG-MSG messages to enable the required output at a 10 Hz rate. The HNR messages remain disabled by default.

3.6 New features

3.6.1 Native support for SLAS (QZSS) signals in Japan

The SLAS correction data, which is broadcasted via QZSS can now be used for enhancing the accuracy of the position calculation in Japan. The SLAS support can be activated using the configuration messages described in the previous sections.

3.6.2 Support for new directly connected sensors

UDR 1.21 introduces support for directly connected ST LSM6DSL and Invensense MPU-6515 sensors. This applies to sensors connected via 2-wire interface to the EVA-M8E module.

3.6.3 Support for PZ90 datum

UDR 1.21 supports PZ-90 position output according to GOST R 55534-2013 (Req 5.6.4).

3.6.4 Motorbike support

UDR 1.21 supports motorbikes including scooters and mopeds. Use UBX-CFG-NAV5 configuration message to enable bike mode.

3.7 Improvements

The following improvements in terms of positioning accuracy and reliability are made in this firmware release:

1. NMEA GPRMC heading message output refined to NMEA / ITU standard
2. HNR state estimation has been enhanced to provide improved output
3. Combined state in Geofencing works now as expected. Previously it did not reset when disabling all geofences
4. Improved altitude accuracy.

4 Specialties and known limitations

4.1 Special vehicle types

This release has been optimized and tested for light road vehicles and motorbikes. Performance and behavior has not been characterized for trains, trams or trolleybuses.