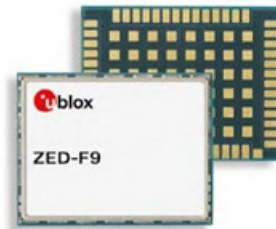P

F9 series Galileo configuration

Addressing GAL eccentricity

Application note

Abstract

This application note explains how to disable Galileo E14 and E18 from being used by the ZED-F9 series receivers. These satellites exhibit eccentric orbits, which might affect u-box high precision receivers using RTCM3 corrections.

Document information

Title	**F9 series Galileo configuration**	
Subtitle	Addressing GAL eccentricity	
Document type	Application note	
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This document applies to the following products:

Product name	Type number	Firmware version	PCN reference
ZED-F9P	ZED-F9P-01B-01 ZED-F9P-02B-00	HPG 1.00 HPG 1.10 HPG 1.11 HPG 1.12 HPG 1.13	N/A
ZED-F9H	ZED-F9H-00B-01 ZED-F9H-01B-00	HDG 1.12 HDG 1.13	
ZED-F9K	ZED-F9K-01B-01	LAP 1.01 LAP 1.20	N/A
ZED-F9R	ZED-F9R-00B-00 ZED-F9R-01B-00	HPS 1.00 HPS 1.20	N/A
UBX-F9940-KA-DR	UBX-F9940-KA-C1003A	LAP 1.10 LAP 1.20	N/A

Contents

1 Overview of Galileo E14 and E18

In 2014 Galileo launched two satellites, E14 and E18, that follow very elliptical orbits, unlike other GNSS satellites which follow almost circular orbits. In comparison to other satellites, the elliptical orbits make the two satellites move differently across the sky.

At the time of writing, these two satellites are marked as unhealthy and as such not used by u-blox receivers.

u-blox recommends applying the configuration instructed in this application note to avoid any problems in the future if the status of the satellites is changed to healthy.

2 Background and symptoms

During the time when Galileo E14 and E18 were set healthy, it was noticed that u-blox high precision receivers using RTCM3 corrections were affected.

The typical behavior seen was a degraded position accuracy. The errors were in the order of 2 – 20 cm. The problem could occur during periods when one of the GAL E14/E18 satellites was tracked with a very high elevation angle, when it was one of the highest satellites on the sky. This was typically observed 1 - 3 times per day and could last for up to an hour.

2.1 Solution

The current solution is to configure the receiver to not acquire and track these two satellites, E14 and E18, as explained below.

Again, u-blox recommends applying the configuration instructed in this application note to avoid any problems in the future if the status of the satellites is changed to healthy.

In the future, it will be possible to update the receiver firmware to again make full use of these two satellites.

3 Setting required configuration

The binary message to disable the use of these two satellites is configured and can be stored in RAM, BBR (battery-backed RAM), and flash.

Writing to RAM will ensure the UBX messages are taken into use immediately. Writing to BBR will allow the UBX message to be carried out at next power on if battery backup is maintained.

Writing to flash will ensure the UBX message will be taken into use at every startup until the firmware is replaced in flash.

☞ The UBX message will be different based on the firmware version the module is running. Check the required UBX message in the tables below:

3.1 List of UBX message options

To store the UBX message to disable the satellites in your selected storage section, send the listed UBX message.

HPG 1.12, HDG 1.12, LAP 1.01, HPS 1.00 and earlier firmware:

Configuration layer	UBX messages
RAM	B5 62 06 8A 1B 00 00 01 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 40 04 00 00 00 00 00 00 5E
BBRAM	B5 62 06 8A 1B 00 00 02 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 40 04 00 00 00 00 00 01 78
Flash	B5 62 06 8A 1B 00 00 04 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 40 04 00 00 00 00 00 03 AC

HPG 1.13, HDG 1.13, LAP 1.20, HPS 1.20 firmware:

Configuration layer	UBX messages
RAM	B5 62 06 8A 1B 00 00 01 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 20 02 00 00 00 00 00 DE 72
BBRAM	B5 62 06 8A 1B 00 00 02 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 20 02 00 00 00 00 00 DF 8C
Flash	B5 62 06 8A 1B 00 00 04 00 00 08 00 C6 20 01 09 00 C6 30 FF 02 0B 00 C6 50 00 20 02 00 00 00 00 00 E1 C0

Table 1: UBX message for selected configuration layer

☞ Check that you have received an ACK after the UBX message is sent.

☞ Refer to the ZED-F9P interface description [1], ZED-F9K interface description [2], ZED-F9R interface description [3], ZED-F9H interface description [5], UBX-F9940-KA-DR interface description [4].

Appendix

A   Glossary

Abbreviation	Definition
ACK	UBX message received and executed acknowledge
BBR	Battery Backed RAM
eFuse	Electrically Programmable Fuse
Flash	EEPROM (electronically erasable programmable read-only memory)
GAL	Galileo
NOFIX	RTK fixed solution is not achieved
RAM	Random Access Memory
RTK	Real Time Kinematic

Table 2: Explanation of the abbreviations and terms used

Related documentation

[1]   ZED-F9P interface description, UBX-18010854

[2]   ZED-F9K interface description UBX-20046191

[3]   ZED-F9R interface description UBX-19056845

[4]   UBX-F9940-KA-DR interface description UBX-19028867 (NDA)

[5]   ZED-F9H interface description, UBX-19030118

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Revision history

Revision	Date	Name	Comments
R01	29-01-2021	ghun	Initial release
R02	17-02-2021	mala	Added section Galileo update.
R03	25-03-2021	mala, mstr	Removed section Galileo update and edited chapters 1 and 2.

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