EVK-7 / EVK-8 / EVK-M8

Evaluation Kits (PCB Version C/D)

User Guide

Abstract

This document describes the structure and use of the EVK-7 / EVK-8 / EVK M8 evaluation kits and provides information for evaluating and testing u blox 7, u-blox 8 and u-blox M8 positioning technology.

www.u-blox.com

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Document Information

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European Union regulatory compliance

EVK-7P, EVK-M8N, EVK-M8C, EVK-M8MEVA, EVK-M8QEVA and EVK-8N comply with all relevant requirements for RED 2014/53/EU. The relevant Declaration of Conformity (DoC) is available at www.u-blox.com within Support > Product resources > Conformity Declaration.

This document applies to the following products:

Product name	Type number	Hardware version	ROM/FLASH version	EOL/PCN reference
EVK-7N	EVK-7N-0-000	C	ROM 1.00 Flash FW1.00	UBX-17049159 (EOL)
EVK-7C	EVK-7C-0-000	C	ROM 1.00, 1.01, Flash FW1.00	UBX-17049159 (EOL)
EVK-7P	EVK-7P-0-000	C	ROM 1.00 PPP1.01, Flash FW1.00	N/A
EVK-7EVA	EVK-7EVA-0-000	C	ROM 1.00	UBX-17049159 (EOL)
EVK-M8N	EVK-M8N-0-01	D	Flash SPG 3.01	N/A
EVK-M8C	EVK-M8C-0-01	D	Flash SPG 3.01	N/A
EVK-M8MEVA	EVK-M8MEVA-0-01	D	ROM SPG 3.01	N/A
EVK-M8QEVA	EVK-M8QEVA-0-00	D	ROM SPG 3.01	N/A
EVK-8N	EVK-8N-0-00	D	ROM SPG 3.01	N/A

Contents

1   Product description

1.1   Overview

EVK-7 / EVK-8 / EVK-M8 evaluation kits make evaluating the high performance u-blox 7, u-blox 8 and u-blox M8 positioning products simple. The built-in USB interface provides both power supply and high-speed data transfer, and eliminates the need for an external power supply. The u-blox evaluation kits are compact, and their user friendly interface and power supply make them ideally suited for use in laboratories, vehicles and outdoor locations. Furthermore, they can be used with a PDA or a notebook PC, making them the perfect companion through all stages of design-in projects.

Evaluation Kit	Description	Suitable for
EVK-7N	u-blox 7 Evaluation Kit with TCXO	MAX-7Q; MAX-7W; NEO-7N u-blox 7 GNSS chips with TCXO
EVK-7C	u-blox 7 Evaluation Kit with Crystal	MAX-7C; NEO-7M u-blox 7 GNSS chips with Crystal
EVK-7P	u-blox 7 Evaluation Kit with Precise Point Positioning	NEO-7P
EVK-7EVA	u-blox 7 Evaluation Kit with EVA-7M	EVA-7M
EVK-M8N	u-blox M8 Evaluation Kit with TCXO	MAX-M8Q;MAX-M8W; NEO-M8N; NEO-M8Q; LEA-M8S u-blox M8 concurrent GNSS chips with TCXO
EVK-M8C	u-blox M8 Evaluation Kit with Crystal	MAX-M8C; NEO-M8M u-blox M8 concurrent GNSS chips with Crystal MAX-8C, u-blox 8 GNSS chips with Crystal
EVK-M8MEVA	u-blox M8 Evaluation Kit with EVA-M8M-0	EVA-M8M, EVA-8M
EVK-M8QEVA	u-blox M8 Evaluation Kit with EVA-M8Q	EVA-M8Q
EVK-8N	u-blox 8 Evaluation Kit with TCXO	MAX-8Q; NEO-8Q u-blox 8 GNSS chips with TCXO

Table 1: List of available EVK-7 / EVK-8 / EVK-M8 evaluation kits

☞   The EVK may have features not available on the real product. Refer to the product data sheet to see if a feature is available on the specific product.

☞   EVK-M8C and EVK-M8MEVA to be set in single GPS or single GLONASS mode for evaluating MAX-8C, u-blox 8 chip with crystal or EVA-8M. More information about GNSS configuration, see section 4.3.11.

1.2   Kit includes

- Evaluation unit
- USB cable
- antenna with 3 m cable
  - For u-blox 7 and 8 EVK: Active GPS / GLONASS antenna
  - For u-blox M8 EVK: Active GPS / Galileo / GLONASS / BeiDou antenna
- Quick Start card

1.3   Software and documentation

The EVK installation software (and documentation) package can be downloaded from the Web; see the Quick Start card for the URL. Separate installation packages are available for EVK-7, EVK-8 or EVK-M8.

1.3.1 u-center GNSS evaluation software

The installation software includes u-center, an interactive tool for configuration, testing, visualization and data analysis of GNSS receivers. It provides useful assistance during all phases of a system integration project.

1.4 System requirements

- PC with USB interface
- Operating system: Windows Vista onwards (x86 and x64 versions)
- USB drivers are provided in the evaluation kit installation software

2   Specifications

Parameter	Specification
Serial Interfaces	1 USB V2.0
	1 RS232, max. baud rate 921,6 kBd DB9 +/- 12 V level 14 pin – 3.3 V logic
	1 DDC (I2C compatible) max. 400 kHz
	1 SPI – clock signal max. 5,5 MHz – SPI DATA max. 1 Mbit/s
Timing Interfaces	1 Time pulse output[1]
Dimensions	105 x 64 x 26 mm
Power Supply	5V via USB or external powered via extra power supply pin 14 (V5_IN) 13 (GND)
Normal Operating temperature	-40°C to +65°C

Table 2: EVK-7 / EVK-8 / EVK-M8 specifications

2.1   Safety precautions

EVK-7 and EVK-M8 must be supplied by an external limited power source in compliance with clause 2.5 of the standard IEC 60950-1. In addition to an external limited power source, only separated or Safety Extra-Low Voltage (SELV) circuits are to be connected to the evaluation kit, including interfaces and antennas.

☞ For more information about SELV circuits see section 2.2 in *Safety standard IEC 60950-1* [26].

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[1] Time pulse not available in all EVK versions. Refer to section 4.3.4 on how to check availability of Time pulse 1 on your EVK.

3   Getting Started

3.1   Software installation

☞ Installation of the EVK-7, EVK-8 or EVK-M8 software and documentation requires Internet access.

Choose Software only or Software and documentation installation package from u-blox website. Once the zip file is downloaded and unzipped, unzip the file in Tools folder and double-click the extracted exe file.

The software components will be installed on your system and placed under the "u-blox" folder in the "Start → Programs" menu.

3.2   Hardware installation

1. Connect the unit to a PC running Microsoft Windows. Options:
   o   USB: Connect via USB port.
   o   UART: Connect via RS232. Set slide switch to I2C.
   o   SPI / I2C compliant DDC: Connect corresponding pins (see Table 5 for pin description). Set slide switch accordingly to SPI or I2C.

☞ Press the RST button after changing the switch.

2. The device must always have power, either via USB on the back or the V5_IN input on the front.
3. Connect the GNSS antenna to the evaluation unit and place the antenna in a location with good sky view.
4. Start the u-center GNSS Evaluation Software and select corresponding COM port and baud rate.

☞ Refer to the u-center User Guide [21] for more information.

3.3   Serial port default configuration

Parameter	Description	Remark
UART Port 1, Input	UBX and NMEA protocol at 9'600 Bd	
UART Port 1, Output	UBX and NMEA protocol at 9'600 Bd	Only NMEA messages are activated
USB, Input	UBX and NMEA protocol	
USB, Output	UBX and NMEA protocol	Only NMEA messages are activated

Table 3: Default configuration

4 Device description

4.1 Interface connection and measurement

For connecting the EVK to a PC, use a standard SUBD-9 cable and the included USB cable.

Additional measurement equipment can be connected to the front connector.
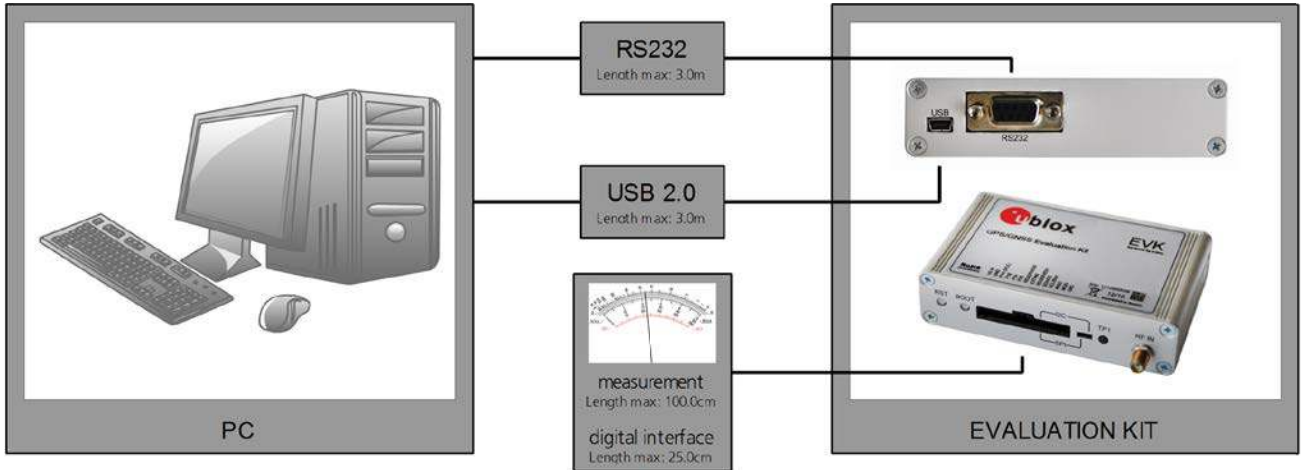
Figure 1: Connecting the unit for power supply and communication

4.2 Active antenna

EVK-7 and EVK-8 evaluation kits include a GPS / GLONASS antenna with a 3.0 m cable. It is possible to connect various active and passive GNSS antennas with SMA connectors to the evaluation unit.

EVK-M8 evaluation kits include a GPS / Galileo / GLONASS / BeiDou antenna with a 3 m cable. It is possible to connect various active and passive GNSS antennas with SMA connectors to the evaluation unit.

The recommended maximum antenna supply current for active antennas is 30 mA.

☞ The characterization and certifications for EVK-M8MEVA and EVK-M8QEVA are applicable only with the active GNSS antenna included in the evaluation kit (or comparable),

4.3 Evaluation unit

Figure 2 shows the front and the rear panel of the EVK-7 or EVK-M8 evaluation unit.

Front panel

Rear panel

Figure 2: EVK-7 / EVK-8 / EVK-M8 evaluation unit – front and rear panels

4.3.1 Antenna connector

An SMA female jack is available on the front side (see Figure 2) of the evaluation unit for connecting an active or passive antenna. DC voltage at the RF input is 3.3 V. The internal short circuit protection limits the maximum current to 60 mA. Please note that the 30 mA maximum supply current for active antenna stays the same. This pin is also ESD protected.

To avoid the damage of RF input caused by ESD or Electrical Overstress, and to seek maximum consistency and repeatability of performance independently of the RF component used, all EVK-7, EVK-8 and EVK-M8 have an onboard LNA.

⚠ The connector is only to be used with a GNSS antenna or simulator. Do not connect this equipment to cable distribution systems.

4.3.2 USB

A USB V2.0 compatible serial port is featured for data communication and power supply.

4.3.3 UART

The evaluation unit includes an RS232 port for serial communication that is compatible with PC serial ports.

Connect using a straight RS232 serial cable with male and female connectors to the port on your PC. The maximum cable length is < 3.0 meters. To configure the RS232 port, use the CFG-PRT command in the u-center application. The maximum operating baud rate is 921.6 kBd.

If you are using a USB to RS232 adaptor cable, you can connect it directly to the evaluation kit RS232 port.

The 9-pin D-SUB female connector is assigned as listed in Table 4:

Pin Nr.	Assignment
1	not connected
2	TXD, GNSS Transmit Data, serial data to DTE
3	RXD, GNSS Receive Data, serial data from DTE
4	not connected
5	GND
6	not connected
7-9	not connected

Table 4: SUB-D9 Connector pin description for EVK-7 / EVK-8 / EVK-M8

4.3.4 Time Pulse

u-blox receivers include a time pulse function providing clock pulses with a configurable pulse period, pulse length and polarity (rising or falling edge). Check the product data sheet for detailed specifications of configurable values.

In the latest EVK-8N and EVK-M8 versions of the evaluation unit, the time pulse signal is connected to the LED on the front panel of the unit and also to the Test Connector. The "TIMEPULSE" text on the evaluation unit label indicates this (see Figure 3). In older versions of the evaluation unit, the time pulse signal is not available in the Test Connector, and the label shows the corresponding pin to be "RESERVED0".

Figure 3: EVK Label

4.3.5 RST button

The RST button on the front panel resets the unit. To avoid an inadvertent reset, the button is recessed.

4.3.6 Safe boot button

This is used to set the unit in safe boot mode. In this mode the receiver executes only the minimal functionality, such as updating new firmware into the SQI flash. In order to set the receiver in safe boot mode please follow these steps.

1. Press the BOOT button and keep holding
2. Press the RST button
3. Release the RST button
4. Release the BOOT button
5. If the UART interface has to be used, the training sequence has to be sent to the receiver. The training sequence is a transmission of 0x55 55 at the baud rate of 9600 Bd. Wait for at least 100 milliseconds before the interface is ready to accept commands.

4.3.7 Slide Switch

Use the slide switch on the front panel to choose between I2C (and UART) and SPI communication ports. You must reset the unit by pressing the RST button when the slide switch has been changed.

1. *I2C* – In this selection the EVK operates with the UART (RS232 DB9 – rear panel or the 3.3 V level TxD (MISO), RxD (MOSI) at the front panel). Also the communication via 3.3 V DDC interface (I2C) is selected.
2. *SPI* – In this selection the EVK operates only with the SPI interface. RS232 (DB9) is switched off.

4.3.8 Test Connector

This 14-pin test-connector provides additional functionality to the EVK, allowing access to the interface pins and an ability to measure the current used by the EVK. All pins are ESD protected.

For accurate measurements, it is recommended to use a cable of at most 1 meter in length. Figure 3 shows an example of a power supply connected to the test connector by using standard adapter cables from the manufacture Hirschmann. Figure 4 shows an example for overall current measurement. When connecting the 3.3 V digital interfaces RS232, SPI and DDC to your application, a cable length less than 25 cm is recommended.

Hirschmann
Part Nr.: 934160100
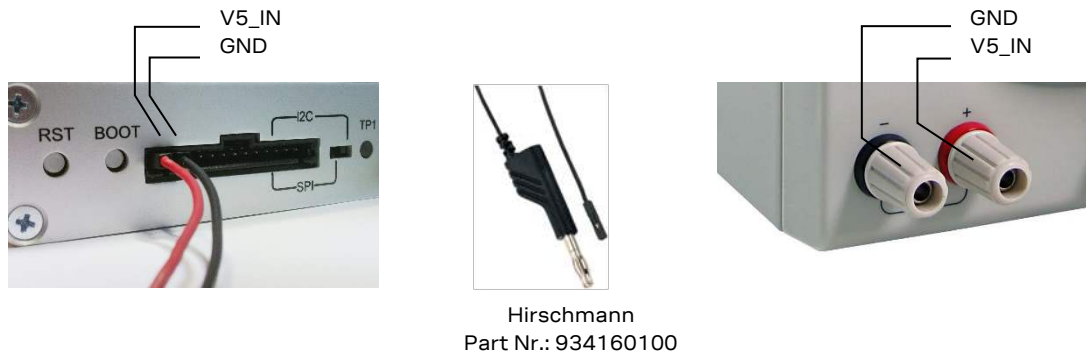
Figure 4: Example 5V DC power supply

PIN Nr.:	PIN NAME	I/O	LEVEL	DESCRIPTION
14	V5_IN	I	4.75 V – 5.25 V	Power input – can be used instead of USB
13	GND	I	-	Common ground pin
12	P1A (VCC)	O	3.3 V	Power output – max. current supply 100 mA 1Ω 1% resistor for over-all current measurement to pin 11 (P1B) *NOTE: the current includes also SQI Flash, LNA*
11	P1B	O		Second connection for over-all current measurement (see Figure 5)
10	P2A	O	3.0 V	Battery output (unloaded) 100 Ω 1% resistor for battery backup current measurement to pin 9 (P2B) *NOTE: There is a current protection to 3 mA. See circuit in figure 7 (D2, D4, R29)*
9	P2B	O		Second junction for battery backup current measurement
8	TIMEPULSE1	O	3.3 V	Time pulse 1 (internally buffered output)[2]
7	EXTINT0	I	3.3 V	External interrupt input
6	RESERVED1	-	-	not connected
5	SDA /CS	I/O	3.3 V	If slide switch on I2C, then DDC interface selected; Function: data input / output If slide switch on SPI, then SPI interface selected; chip select input – LOW ACTIVE
4	SCL / SCK	I/O	3.3 V	Clock input / output
3	TxD / MISO	I/O	3.3 V	If slide switch on I2C, then DDC interface selected / UART TxD (3.3V Level) If slide switch on SPI, then SPI interface selected; Master in Slave out (MISO)
2	RxD / MOSI	I/O	3.3 V	If slide switch on I2C, then DDC interface selected / UART RxD (3.3V Level) If slide switch on SPI, then SPI interface selected; Master out Slave in (MOSI)
1	GND	I	-	Common ground pin

Table 5: Connector pin description for EVK-7 / EVK-8 / EVK-M8 (pins numbered from right to left on the front panel)

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[2] Time pulse not available in all EVK versions. Refer to section 4.3.4 on how to check availability of Time pulse 1 on your EVK.

4.3.9 LED

On the front panel of the unit, a single blue LED shows the time pulse 1 signal. The LED starts flashing one pulse per second during a GNSS fix. If there is no GNSS fix, the LED will only light, without flashing.

4.3.10 Backup Battery

There is a backup battery in the evaluation unit. This is necessary to store orbital information between operations and to enable faster start-up. It is a RENATA 3.0 V Li / MnO² battery of the type CR2450. The battery has a rated capacity of 540 mA. The battery operating temperature range is -40° C to +85° C.

In case the built-in backup battery runs low or empty after a long storage period, purchase the above described battery for replacement (refer to the section 10 for battery replacement guidelines).

⚠   CAUTION! RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS!

4.3.11 GNSS Configuration

The EVK-7 and EVK-8 supports GPS, QZSS and GLONASS. The EVK-M8N/C and EVK-M8MEVA/EVK-M8QEVA supports GPS, Galileo, QZSS, GLONASS, and BeiDou.

The GNSS to be used can be configured on u-center (View → Messages View then UBX-CFG-GNSS). For more information, refer to the *u-center User Guide* [21], the *u-blox 7 Receiver Description including Protocol Specification* [9] and *u-blox 8 / u-blox M8 Receiver Description including Protocol Specification* [20].

4.3.12 RTC Configuration (EVK-7EVA and EVK-M8MEVA)

The EVK-7EVA and EVK-M8MEVA include the EVA-7M or EVA-M8M GNSS receiver with an external RTC. By default, the EVA-7M or EVA-M8M module is not running in single crystal mode. The EVK-7EVA and EVK-M8MEVA evaluation kits can be set to single crystal mode by using the configuration string described in the EVA-7M Hardware Integration Manual [8] and the EVA-8M / EVA-M8M Hardware *Integration Manual* [18].

☞   Applying the configuration string results in a permanent change and cannot be reversed. The current consumption is significantly higher in single crystal mode. For more information see the *EVA-7M Data Sheet* [5], *EVA-8M Data Sheet* [25] and the *EVA-M8 Data Sheet* [13].

5   Measuring tracking current

To measure the tracking current with EVK-7 / EVK-8 / EVK-M8, follow these steps:

1. Connect a true RMS voltmeter across P1A (VCC) and P1B of the front connector. (see Figure 5)
2. Wait 12 minutes to download all GNSS orbital data, or download all the Aiding Data via the AssistNow Online service
3. Read the voltage (and average if necessary) on the voltmeter and convert to current (1 mV equals 1 mA)
4. Perform the test with good signals and clear sky view to ensure that the receiver can acquire the satellite signals.

☞   The overall current measurement also includes the internal SQI flash. For ROM based products the current will be lower.

For more details see the circuit in Figure 9.

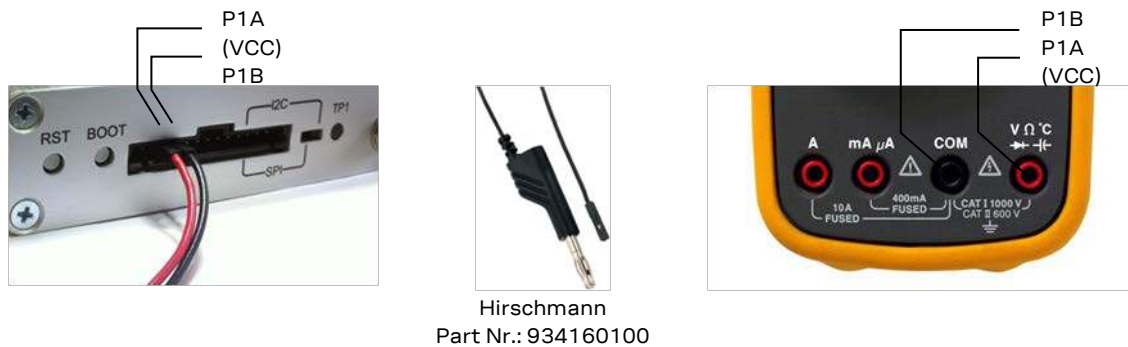Hirschmann
Part Nr.: 934160100

Figure 5: Example – tracking current measurement

6 Board layout

6.1 PCB Version C

Figure 7 shows the EVK-7 layout (PCB Version C). See Table 6 for the component list of the EVB.
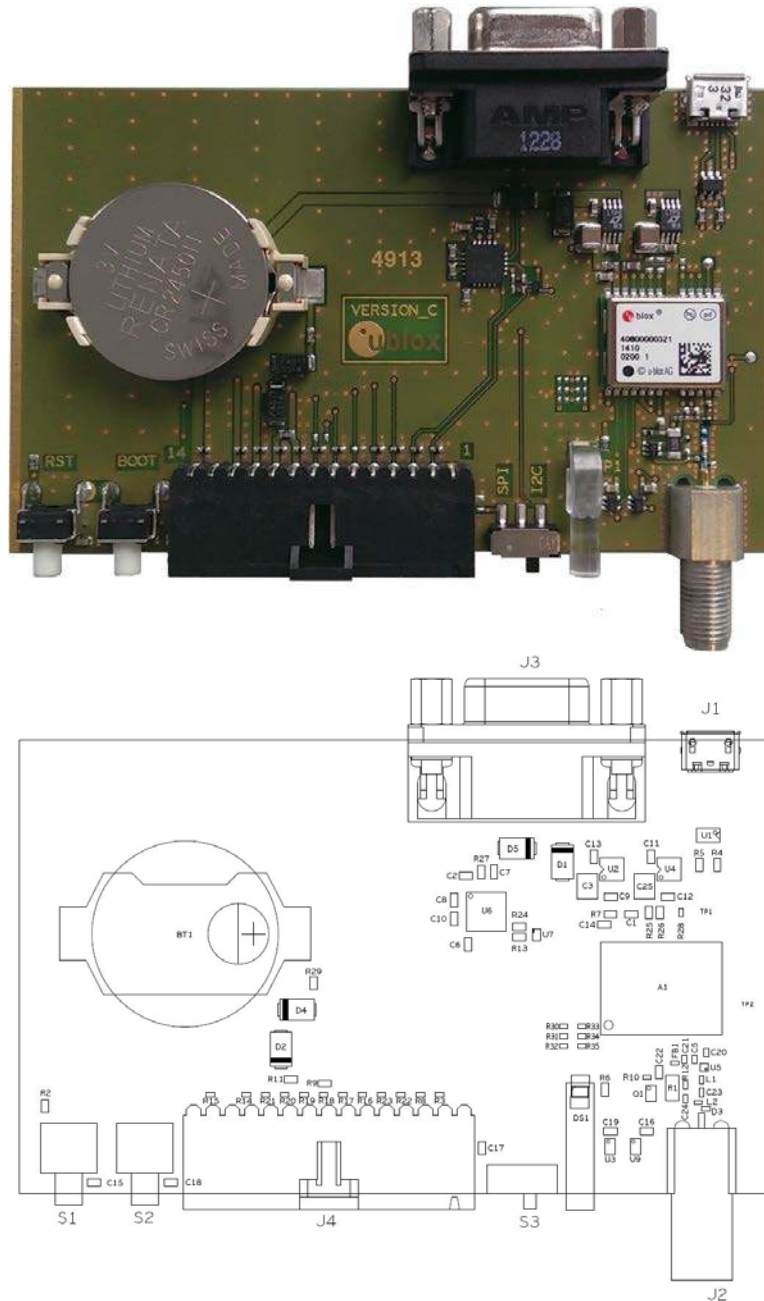

Figure 6: EVB-7 layout

PART	DESCRIPTION
A1	GNSS RECEIVER -40/+85C
BT1	BATTERY HOLDER RENATA CR2450N 3V
C1 C11 C13 C22	CAP CER X5R 0603 1U0 10% 6.3V
C10 C14 C16 C19 C2 C6 C7 C8	CAP CER X7R 0603 100N 10% 10V
C12 C9	CAP CER X7R 0603 10N 10% 25V
C20	CAP CER COG 0402 1P8 +/-0.1P 25V
C21	CAP CER COG 0402 22P 5% 25V
C23	CAP CER COG 0402 47P 5% 25V
C24	CAP CER X5R 0402 100N 10% 10V
C25 C3	CAP CER X5R 1210 10U 10% 10V
C5	CAP CER X7R 0402 1N0 10% 16V
D1 D2 D4 D5	SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER SS14 1A -55/+125C
D3 R17 R18 R20 R21 R22 R23	ESD PROTECTION FOR HIGH SPEED LINES, TYCO, 0.25PF, PESD0402-140 -55/+125C
DS1	LED OSRAM HYPER MINI TOPLED LB M673-L1N2-35 BLUE 0.02A
FB1	FERRITE BEAD MURATA BLM15HD 0402 1000R@100MHZ
J1	CON USB RECEPTACLE MICRO B TYPE SMD – MOLEX 47346-0001 – TID60001597 30V 1A
J2	CON SMA SMD STRAIGHT JACK 11.4MM HEIGHT WITHOUT WASHER AND NUT
J3	9 POLE SUBD CONNECTOR FEMALE
J4	14PIN 90° 2.54MM PITCH DISCONNECTABLE CRIMP CONNECTOR -40/+85C
L1	IND MURATA LQW15A 0402 8N7 3% 0.54A -55/+125C
L2	IND MURATA LQW15A 0402 120N 5% 0.64A -55/+125C
Q1	MBT3906DW1T1G DUAL GENERAL PURPOSE TRANSISTOR 0.2A 0.15W -40/+125C
R1	RES THICK FILM CHIP 1206 10R 5% 0.25W
R10	RES THICK FILM CHIP 0402 220R 5% 0.1W
R11 R2 R6	RES THICK FILM CHIP 0603 100R 5% 0.1W
R12	RES THICK FILM CHIP 0402 2K2 5% 0.1W
R13 R24 R27	RES THICK FILM CHIP 0603 100K 5% 0.1W
R14 R15 R19 R3 R8	VARISTOR BOURNS MLE SERIES CG0402MLE-18G 18V
R29	RES THICK FILM CHIP 0603 1K0 5% 0.1W
R4 R5	RES THICK FILM CHIP 0603 22R 5% 0.1W -55/+125C
R7	RES THICK FILM CHIP 0603 1R0 5% 0.1W
S1 S2	SWITCH SPST ON 1POL TYCO -40/+85C
S3	2 WAY SUB-MINIATURE SLIDE SWITCH SMD JS SERIES – SPDT -40/+85C
U1	USB DATA LINE PROTECTION ST USBLC6-2SC6 SOT23-6
U2 U4	LOW DROPOUT REGULATOR LINEAR LT1962 MS8 3.3V 0.3A
U3 U9	TINY LOGIC UHS BUFFER OE_N ACTIVE LOW FAIRCHILD NC7SZ125 SC70
U5	LOW NOISE AMPLIFIER GAAS MMIC 1.575 GHZ 1.5V-3.6V JRC EPFFP6-A2 3.6V -40/+85C
U6	RS-232 TRANSCEIVER 1MBIT 3-5,5VOLT TRSF3223 – VQFN20 5.5V -40/+85C
U7	TINY LOGIC ULP-A 2-INPUT AND GATE 1.45X1.0 6-LEAD MICROPAK -40/+85C

Table 6: EVB-7 component list

6.2 PCB Version D

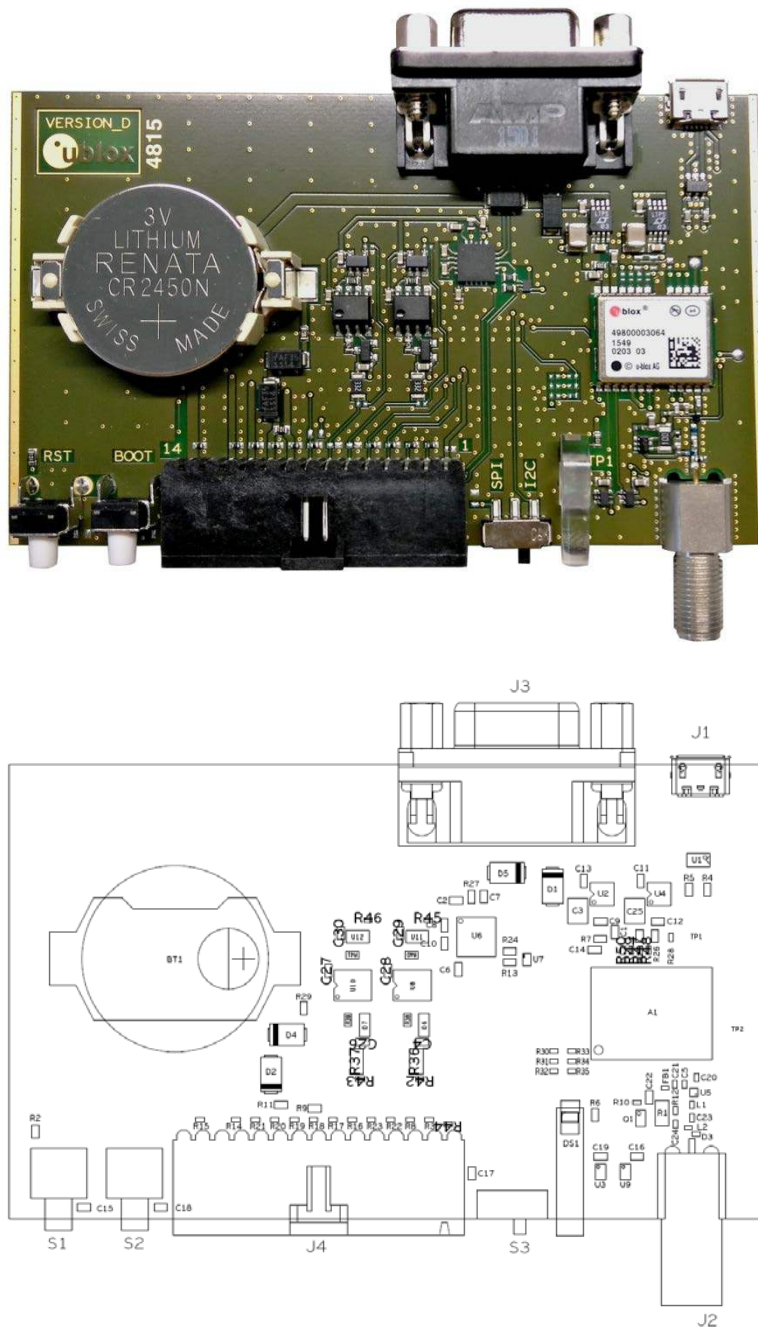Figure 8 shows the EVK-8 / EVK-M8 board layout (PCB Version D). See Table 7 for the component list of the EVB.

Figure 7: EVB-8 / EVB-M8 layout

PART	DESCRIPTION
A1	GNSS RECEIVER -40/+85C
BT1	BATTERY HOLDER RENATA CR2450N 3V
C1 C11 C13 C22	CAP CER X5R 0603 1U0 10% 6.3V
C2 C6 C7 C8 C10 C14 C16 C19	CAP CER X7R 0603 100N 10% 10V
C3 C25	CAP CER X5R 1210 10U 10% 10V
C5	CAP CER X7R 0402 1N0 10% 16V
C9 C12	CAP CER X7R 0603 10N 10% 25V
C20	CAP CER COG 0402 1P8 +/-0.1P 25V
C21	CAP CER COG 0402 22P 5% 25V
C23	CAP CER COG 0402 47P 5% 25V
C24	CAP CER X5R 0402 100N 10% 10V
D1 D2 D4 D5	SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER SS14 1A -55/+125C
D3 R17 R18 R20 R21 R22 R23	ESD PROTECTION FOR HIGH SPEED LINES, TYCO, 0.25PF, PESD0402-140 -55/+125C
DS1	LED OSRAM HYPER MINI TOPLED LB M673-L1N2-35 BLUE 0.02A
FB1	FERRITE BEAD MURATA BLM15HD 0402 1000R@100MHZ
J1	CON USB RECEPTACLE MICRO B TYPE SMD - MOLEX 47346-0001 - TID60001597 30V 1A
J2	CON SMA SMD STRAIGHT JACK 11.4MM HEIGHT WITHOUT WASHER AND NUT
J3	9 POLE SUBD CONNECTOR FEMALE
J4	14PIN 90\xB0 2.54MM PITCH DISCONNECTABLE CRIMP CONNECTOR -40/+85C
L1	IND MURATA LQW15A 0402 8N7 3% 0.54A -55/+125C
L2	IND MURATA LQW15A 0402 120N 5% 0.64A -55/+125C
Q1	MBT3906DW1T1G DUAL GENERAL PURPOSE TRANSISTOR 0.2A 0.15W -40/+125C
R1	RES THICK FILM CHIP 1206 10R 5% 0.25W
R2 R6 R11	RES THICK FILM CHIP 0603 100R 5% 0.1W
R3 R8 R14 R15 R19	VARISTOR BOURNS MLE SERIES CG0402MLE-18G 18V
R4 R5	RES THICK FILM CHIP 0603 22R 5% 0.1W -55/+125C
R7	RES THICK FILM CHIP 0603 1R0 5% 0.1W
R9	RES THICK FILM CHIP 0603 51R 1% 0.063W (was DNI, but is now installed by default) [3]
R10	RES THICK FILM CHIP 0402 220R 5% 0.1W
R12	RES THICK FILM CHIP 0402 2K2 5% 0.1W
R13 R24 R27	RES THICK FILM CHIP 0603 100K 5% 0.1W
R29	RES THICK FILM CHIP 0603 1K0 5% 0.1W
R43 R44 R46 R47 R48 R49 R50	RES THICK FILM CHIP 0402 0R 0 0.1W
S1 S2	SWITCH SPST ON 1POL TYCO -40/+85C
S3	2 WAY SUB-MINIATURE SLIDE SWITCH SMD JS SERIES - SPDT -40/+85C
U1	USB DATA LINE PROTECTION ST USBLC6-2SC6 SOT23-6
U2 U4	LOW DROPOUT REGULATOR LINEAR LT1962 MS8 3.3V 0.3A
U3 U9	TINY LOGIC UHS BUFFER OE_N ACTIVE LOW FAIRCHILD NC7SZ125 SC70
U5	LOW NOISE AMPLIFIER GAAS MMIC 1.575 GHZ 1.5V-3.6V JRC EPFFP6-A2 3.6V -40/+85C
U6	RS-232 TRANSCEIVER 1MBIT 3-5,5VOLT TRSF3223 - VQFN20 5.5V 5.5V -40/+85C
U7	TINY LOGIC ULP-A 2-INPUT AND GATE 1.45X1.0 6-LEAD MICROPAK -40/+85C

Table 7: EVB-8 / EVB-M8 component list

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[3] Time pulse not available in all EVK versions. Refer to section 4.3.4 on how to check availability of Time pulse 1 on your EVK.
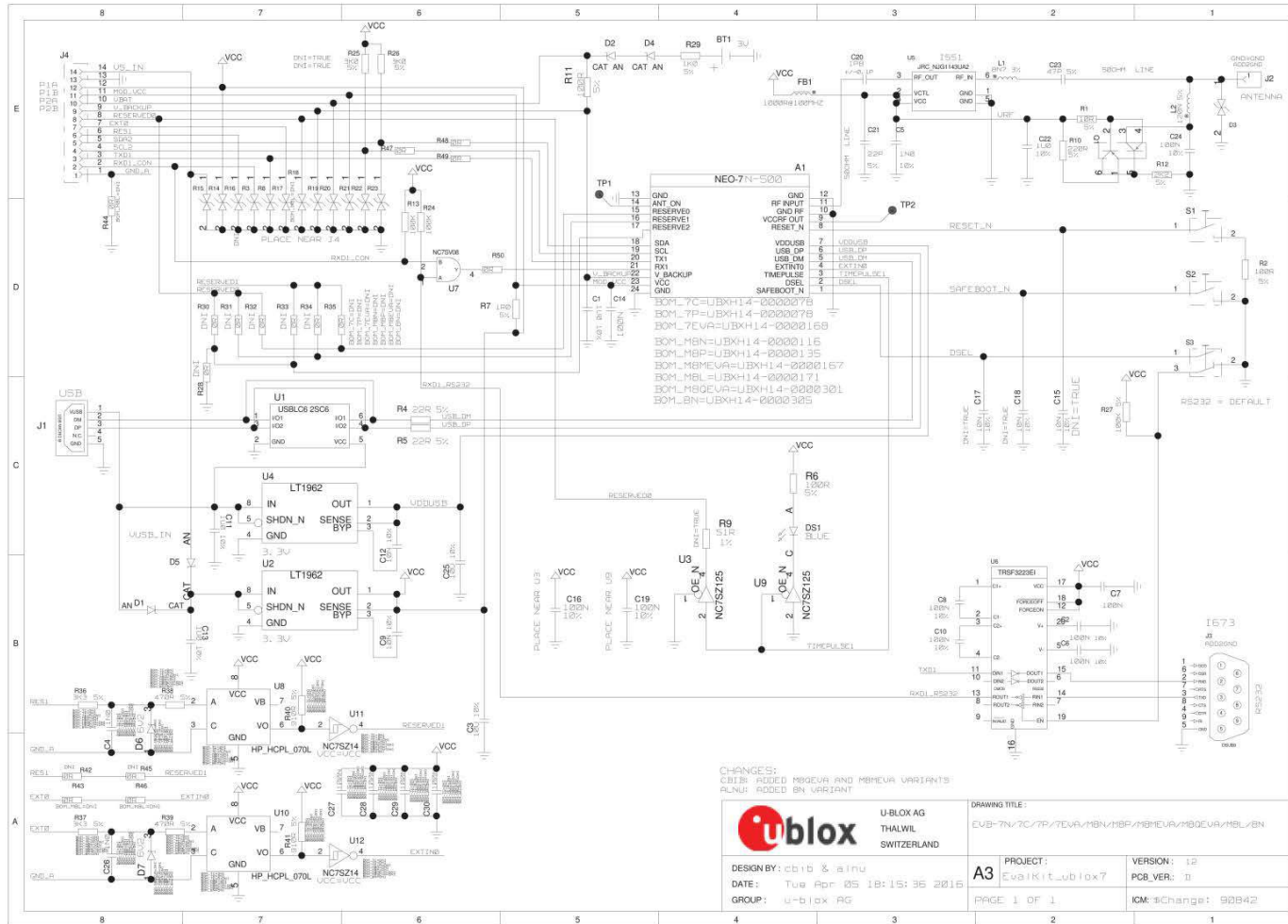
7 Schematic

Figure 8: Schematic EVK-7 / EVK-8 / EVK-M8: DNI=TRUE in the schematic means: Component not installed

8 Battery replacement

To replace the battery (Number 5 in Figure 10), open the unit (unscrew four screws on the front panel).
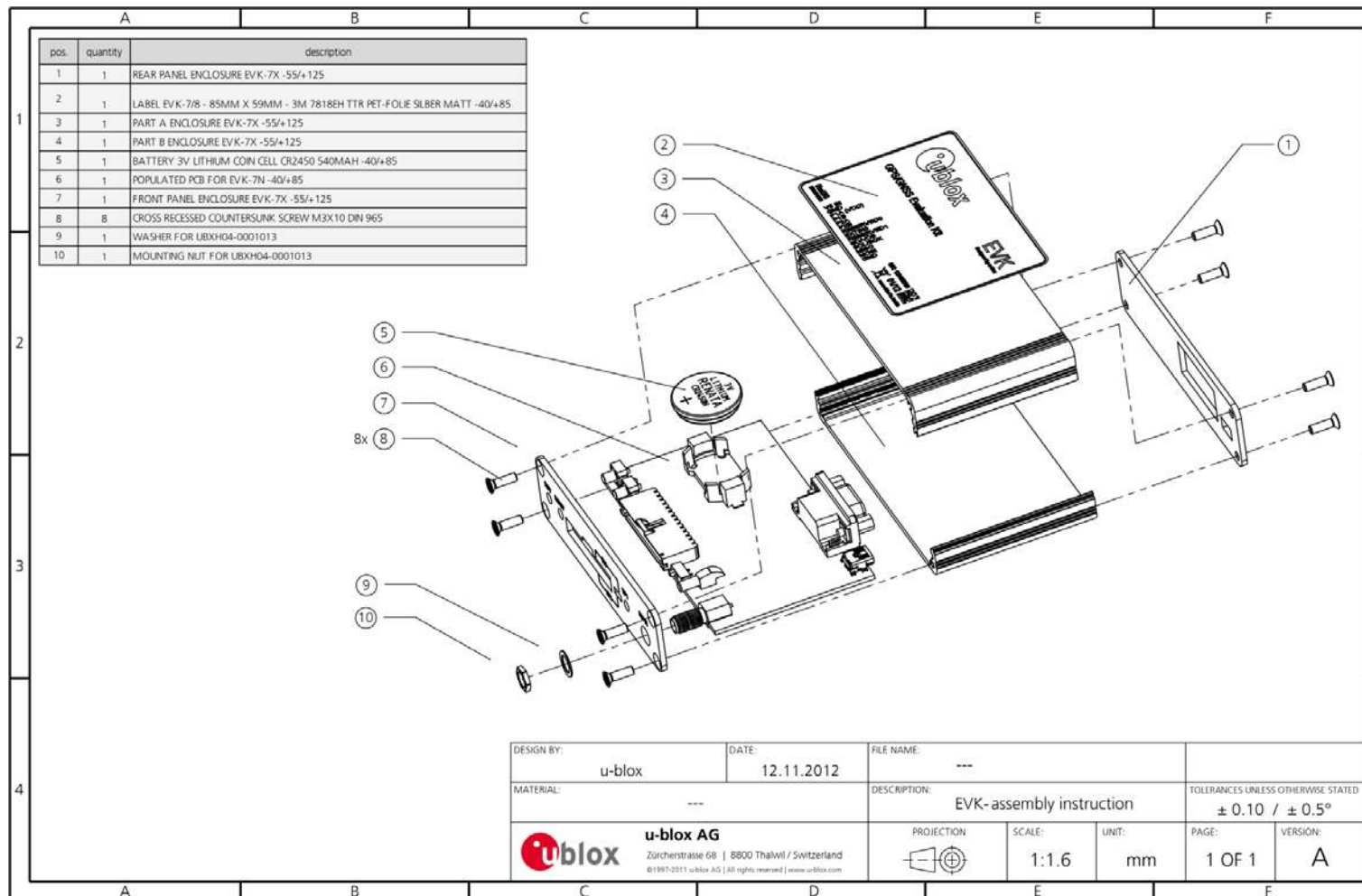

Figure 9: EVK-7 / EVK-8 / EVK-M8 battery location

9 Troubleshooting

My application (e.g. u-center) does not receive anything

Check whether the blue LED on the evaluation unit is blinking. Also make sure that the USB cable is properly connected to the evaluation unit and the PC. By default, the evaluation unit outputs NMEA protocol on Serial Port 1 at 9600 Bd, or on the USB.

My application (e.g. u-center) does not receive all messages

When using UART, make sure the baud rate is sufficient. If the baud rate is insufficient, GNSS receivers based on u-blox 7 and u-blox M8 GNSS technology will skip excessive messages. Some serial port cards/adapters (i.e. USB to RS232 converter) frequently generate errors. If a communication error occurs while u-center receives a message, the message will be discarded.

My application (e.g. u-center) loses the connection to the GNSS receiver

u-blox 7 / u-blox 8 / u-blox M8 positioning technology and u-center have an autobauding feature. If frequent communication errors occur (e.g. due to problems with the serial port), the connection may be lost. This happens because u-center and the GNSS receiver both autonomously try to adjust the baud rate. Do not enable the u-center autobauding feature if the GNSS receiver has the autobauding flag enabled.

The COM port does not send any messages

Be sure that the slide switch at the front panel is set to I2C and not SPI. In SPI Mode the RS232 pins on the DB9 connector are switched off and the RxD and TxD output at the front panel are used for SPI (MISO, MOSI).

NOTE: After changing the slide switch, always reset the EVK, otherwise the change will not take place.

Some COM ports are not shown in the port list of my application (e.g. u-center)

Only the COM ports that are available on your computer will show up in the COM port drop down list. If a COM Port is gray, another application running on this computer is using it.

The position is off by a few dozen meters

u-blox 7 / u-blox 8 / u-blox M8 GNSS technology starts up with the WGS84 standard GNSS datum. If your application expects a different datum, you'll most likely find the positions to be off by a few dozen meters. Don't forget to check the calibration of u-center map files.

The position is off by hundreds of meters

Position drift may also occur when almanac navigation is enabled. The satellite orbit information retrieved from an almanac is much less accurate than the information retrieved from the ephemeris. With an almanac only solution, the position will only have an accuracy of a few kilometers but it may start up faster or still navigate in areas with obscured visibility when the ephemeris from one or several satellites have not yet been received. The almanac information is NOT used for calculating a position, if valid ephemeris information is present, regardless of the setting of this flag.

In NMEA protocol, position solutions with high deviation (e.g. due to enabling almanac navigation) can be filtered with the Position Accuracy Mask. UBX protocol does not directly support this since it provides a position accuracy estimation, which allows the user to filter the position according to his requirements. However, the 'Position within Limits' flag of the UBX-NAV-STATUS message indicates whether the configured thresholds (i.e. P Accuracy Mask and PDOP) are exceeded.

TTFF times at startup are much longer than specified

At startup (after the first position fix), the GNSS receiver performs an RTC calibration to have an accurate internal time source. A calibrated RTC is required to achieve minimal startup time.

Before shutting down the receiver externally, check the status in MON-HW in field 'Real Time Clock Status'. Do not shut down the receiver if the RTC is not calibrated.

The EVK-7 / EVK-8 / EVK-M8 does not meet the TTFF specification

Make sure the antenna has a good sky view. An obstructed view leads to prolonged startup times. In a well-designed system, the average of the C/No ratio of high elevation satellites should be in the range of 40 dBHz to about 50 dBHz. With a standard off-the-shelf active antenna, 47 dBHz should easily be achieved. Low C/No values lead to a prolonged startup time.

EVK-7 / EVK-8 / EVK-M8 does not preserve the configuration in case of reset

u-blox 7 / u-blox 8 / u-blox M8 GNSS technology uses a slightly different concept than most other GNSS receivers do. Settings are initially stored to volatile memory. In order to save them permanently, sending a second command is required. This allows testing the new settings and reverting to the old settings by resetting the receiver if the new settings aren't good. This provides safety, as it is no longer possible to accidentally program a bad configuration (e.g. disabling the main communication port).

The EVK-7 / EVK-8 / EVK-M8 does not work properly when connected with a GNSS simulator

When using an EVK together with a GNSS simulator, please pay attention to proper handling of the EVK. A GNSS receiver is designed for real-life use, i.e. time is always moving forward. By using a GNSS simulator, the user can change scenarios, which enables jumping backwards in time. This can have serious side effects on the performance of GNSS receivers.

The solution is to configure the GPS week rollover to 1200 (as indicated in Figure 10), which corresponds to Jan 2003. Then, issue the Cold Start command before every simulator test to avoid receiver confusion due to the time jumps.
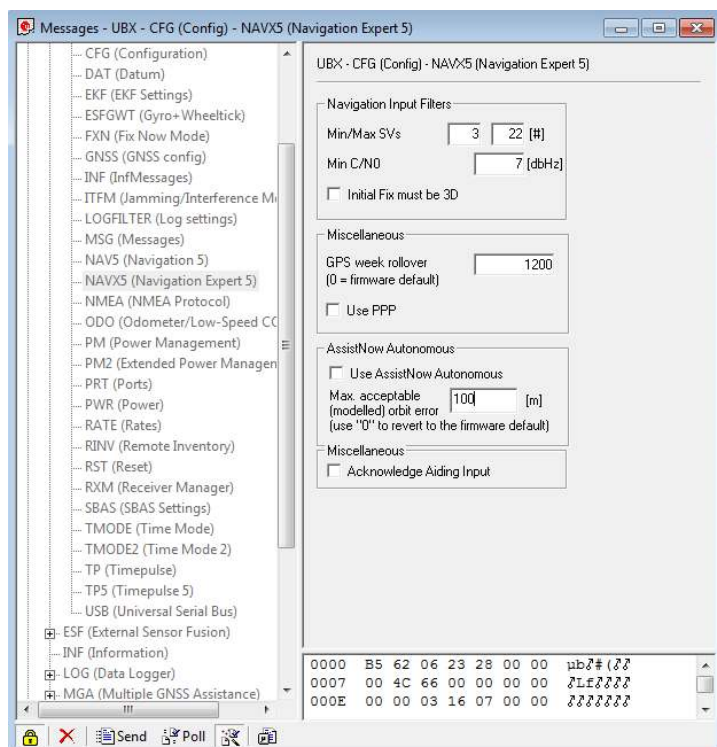

Figure 10: Configuration instruction for using the EVK with a GNSS simulator

Power Save Mode and USB

For communication in Power Save Mode, use the RS232.

EVK-7 / EVK-8 / EVK-M8 receives GPS and GLONASS

Use u-center, version 7.02 or later (version 8.20 upwards for EVK-M8 and EVK-8). Message UBX-CFG-GNSS allows switching on and off the supported GNSS.

10 Common evaluation pitfalls

- Parameter may have the same name but a different definition. GNSS receivers may have a similar size, price and power consumption but can still have different functionalities (e.g. no support for passive antennas, different temperature range). Also, the definitions of Hot, Warm, Cold Start times may differ between suppliers.
- Verify design-critical parameters; do not base a decision on unconfirmed numbers from datasheets.
- Try to use identical or at least similar settings when comparing the GNSS performance of different receivers.
- Data, which has not been recorded at the same time and the same place, should not be compared. The satellite constellation, the number of visible satellites and the sky view might have been different.
- Do not compare momentary measurements. GNSS is a non-deterministic system. The satellite constellation changes constantly. Atmospheric effects (i.e. dawn and dusk) have an impact on signal travel time. The position of the GNSS receiver is typically not the same between two tests. Comparative tests should therefore be conducted in parallel by using one antenna and a signal splitter; statistical tests shall be run for 24 hours.
- Monitor the Carrier-To-Noise-Ratio. The average C/No ratio of the high elevation satellites should be between 40 dBHz and about 50 dBHz. A low C/No ratio will result in a prolonged TTFF and more position drift.
- When comparing receivers side by side, make sure that all receivers have the same signal levels. The best way to achieve this is by using a signal splitter. Comparing results measured with different antenna types (with different sensitivity) will lead to incorrect conclusions.
- Try to feed the same signal to all receivers in parallel (i.e. through a splitter); the receivers won't have the same sky view otherwise. Even small differences can have an impact on the accuracy. One additional satellite can lead to a lower DOP and less position drift.
- When doing reacquisition tests, cover the antenna in order to block the sky view. Do not unplug the antenna since the u-blox 7 / u-blox 8 / u-blox M8 positioning technology continuously performs a noise calibration on idle channels.

Related documents

[1]   UBX-G7020 Data Sheet, Doc. No UBX-13004145 (NDA required)

[2]   NEO-7 Data Sheet, Doc. No UBX-13003830

[3]   NEO-7P Data Sheet, Doc. No UBX-13003787

[4]   MAX-7 Data Sheet, Doc. No UBX-13004068

[5]   EVA-7M Data Sheet, Doc. No UBX-13000581

[6]   UBX-G7020 Hardware Integration Manual, Doc. No UBX-13004144 (NDA required)

[7]   MAX-7 / NEO-7 Hardware Integration Manual, Doc. No UBX-13003704

[8]   EVA-7M Hardware Integration Manual, Doc. No UBX-12003235

[9]   u-blox 7 Receiver Description including Protocol Specification, Doc. No GPS.G7-SW-12001 (Public Release), GPS.G7-SW-12002 (NDA required)

[10]   UBX-M8030 (FW3) Data Sheet, Doc. No UBX-15030040 (NDA required)

[11]   NEO-M8 Data Sheet (FW3), Doc. No UBX-15031086

[12]   MAX-M8 (FW3) Data Sheet, Doc. No UBX-15031506

[13]   EVA-M8 (FW3) Data Sheet, Doc. No UBX-16014189

[14]   LEA-M8S (FW3) Data Sheet, Doc. No UBX-16010205

[15]   UBX-G8020/UBX-M8030 Hardware Integration Manual, Doc. No UBX-15031474 (NDA required)

[16]   NEO-8Q / NEO-M8 Hardware Integration Manual, Doc. No UBX-15029985

[17]   MAX-8 / MAX-M8 Hardware Integration Manual, Doc. No UBX-15030059

[18]   EVA-8M / EVA-M8 series Hardware Integration Manual, Doc. No UBX-16010593

[19]   LEA-M8S (FW3) Hardware Integration Manual, Doc. No UBX-15030060

[20]   u-blox 8 / u-blox M8 Receiver Description including Protocol Specification, Doc. No UBX-13003221 (Public Release), UBX-13002887 (NDA required)

[21]   u-center – User Guide, Doc. No UBX-13005250

[22]   UBX-G8020 Data Sheet, Doc. No UBX-16005907

[23]   MAX-8 Data Sheet, Doc. No UBX-16000093

[24]   NEO-8Q Data Sheet, Doc. No UBX-15031913

[25]   EVA-8M Data Sheet, Doc. No UBX-16009928

[26]   Information technology equipment – Safety Standard IEC 60950-1
        https://webstore.iec.ch/publication/4024

☞   For regular updates to u-blox documentation and to receive product change notifications, register on our homepage (www.u-blox.com).

Revision history

Revision	Date	Name	Comments
R01	14-May-2014	mkes	Early Production Information
R02	06-Aug-2014	julu	Updated section 4.3.1; added EVK-7EVA related information (Table 1, section 4.3.11, Figure 9)
R03	08-Oct-2014	julu	Added EVK-M8EVA related information
R04	19-Feb-2016	msul	Updated FW information and related content for EVK-M8N and EVK-M8C.
R05	14-Jun-2016	jhak	Added EVK-8N and EVK-M8MEVA related content, removed obsolete EVK-M8EVA, updated Related Documents section.
R06	22-Aug-2016	jhak	Added EVK-M8QEVA related content
R07	17-Jan-2017	jhak	Improved resolution of Schematic in Figure 9
R08	14-Jun-2017	jesk	Added information on time pulse availability for latest EVK-8 and EVK-M8 evaluation units. Added section 2.1 (Safety Precautions).
R09	05-Dec-2017	rmak	Added information on RED DoC in European Union regulatory compliance and EVK-7N, EVK-7C and EVK-7EVA EOL information (page 2). Removed extra backup battery from EVK content in section 1.2. Added note that EVK-M8MEVA and EVK-M8QEVA validity of certification is limited to use with active GNSS antenna included in the kit (or comparable) in section 4.2.
R10	03-Sep-2018	julu	Corrected product type numbers for EVK-7x in page 2.

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