EVK-M8xCAM
Evaluation Kits

User Guide

Abstract

This document describes the structure and use of the EVK-M8QCAM and EVK-M8CCAM evaluation kits and provides information for evaluating and testing the u-blox CAM-M8Q and CAM-M8C GNSS chip antenna modules.

www.u-blox.com

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Document Information

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Document status explanation

Objective Specification	Document contains target values. Revised and supplementary data will be published later.
Advance Information	Document contains data based on early testing. Revised and supplementary data will be published later.
Early Production Information	Document contains data from product verification. Revised and supplementary data may be published later.
Production Information	Document contains the final product specification.

European Union regulatory compliance

EVK-M8QCAM & EVK-M8CCAM comply with all relevant requirements for RED 2014/53/EU. The EVK-M8xCAM 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	ROM/FLASH version	PCN reference
EVK-M8QCAM	EVK-M8QCAM-0-01	ROM SPG 3.01	N/A
EVK-M8CCAM	EVK-M8CCAM-0-01	ROM SPG 3.01	N/A

Preface

Using this guide

This guide assumes, the user has basic computer skills and is familiar with the Windows Graphical User Interface (GUI) and GNSS receiver environments.

The following symbols are used in the document to highlight information:

⚠ **A warning symbol indicates actions that could negatively impact or damage the device.**

☞ An index finger points out key information pertaining to device operation and performance.

Warnings and certifications

EVK-M8QCAM and EVK-M8CCAM are Electrostatic Sensitive Devices (ESD).

CAUTION! RISK OF SHORT CIRCUIT OF THE BATTERY WHEN TOUCHING IT WITH CONDUCTING PARTS. IN THE UNLIKELY EVENT OF A FAILURE IN THE INTERNAL PROTECTION CIRCUITRY THERE IS A RISK OF AN EXPLOSION WHEN CHARGING FULLY OR PARTIALLY DISCHARGED BATTERIES. REPLACE THE BATTERY IF IT NO LONGER HAS SUFFICIENT CHARGE FOR UNIT OPERATION. CONTROL THE BATTERY BEFORE USING IF THE DEVICE HAS NOT BEEN OPERATED FOR AN EXTENDED PERIOD OF TIME.

Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

EVK-M8QCAM and EVK-M8CCAM evaluation kits are RoHS compliant and green (no halogens).

Contents

1 Product description

1.1 Overview

The EVK-M8QCAM and EVK-M8CCAM evaluation kits simplify the evaluation of the high performance u-blox CAM-M8Q and CAM-M8C GNSS chip antenna modules. 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	Suitable for
EVK-M8QCAM: u-blox M8 concurrent GNSS chip antenna Evaluation Kit with TCXO	CAM-M8Q
EVK-M8CCAM: u-blox M8 concurrent GNSS chip antenna Evaluation Kit with Crystal	CAM-M8C

Table 1: List of available evaluation kits

1.2 Kit includes

- Evaluation unit (plain PCB board)
- USB cable
- Active GPS / GLONASS / Galileo / BeiDou antenna with 3 m cable
- Quick Start card

☞ Because of the integrated antennas in the CAM-M8Q and CAM-M8C modules, the standard u-blox GNSS EVK aluminum box cannot be used for the EVK-M8QCAM and EVK-M8CCAM.

☞ A plastic cap is attached on the top of the antenna module in EVK-M8QCAM and EVK-M8CCAM. The purpose of the cap is to prevent air flowing inside the CAM-M8Q and CAM-M8C shield.

1.3 Software and documentation

The EVK-M8QCAM/M8CCAM installation software (and documentation) package can be downloaded from the Web; see the Quick Start card for the URL.

1.4 u-center GNSS evaluation software

The installation software includes u-center, which is 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.

1.5 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: PC compatible
	1 DDC (I^{2}C compatible) max. 400 kHz
Timing Interfaces	1 Time pulse output
Dimensions	100 x 60 x 26 mm
Power Supply	5 V 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-M8QCAM and EVK-M8CCAM specifications

2.1 Safety precautions

EVK-M8QCAM and EVK-M8CCAM must be supplied by an external limited power source in compliance with clause 2.5 of the standard IEC 60950-1. In addition to the 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 [5].

3 Getting Started

3.1 Software installation

☞ Installation of the EVK-M8QCAM/M8CCAM software and documentation requires internet access.

- Choose the "Software only" or "Software and documentation" installation package from the u-blox website. Once the zip file is downloaded, unzip the file in the 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:
   - USB: Connect via USB port. Set the slide switch to USB.
   - UART: Connect via RS232. Set the slide switch to RS232.
2. The device must always have power, either via the USB port on the rear or the V5_IN input on the front.
3. The EVK-M8QCAM or EVK-M8CCAM evaluation kit includes a CAM-M8Q or CAM-M8C concurrent GNSS module with embedded chip antenna. Optionally, an external GNSS antenna can be connected to the evaluation unit. Be sure to place the EVK in a location with unobstructed sky views.
4. Start the u-center GNSS Evaluation Software and select corresponding COM port and baud rate. (Refer to the u-center User Guide [4] for more information.)

3.3 Serial port default configuration

Parameter	Description	Remark
UART Port 1, Input	UBX and NMEA protocol at 9600 Bd	
UART Port 1, Output	UBX and NMEA protocol at 9600 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.
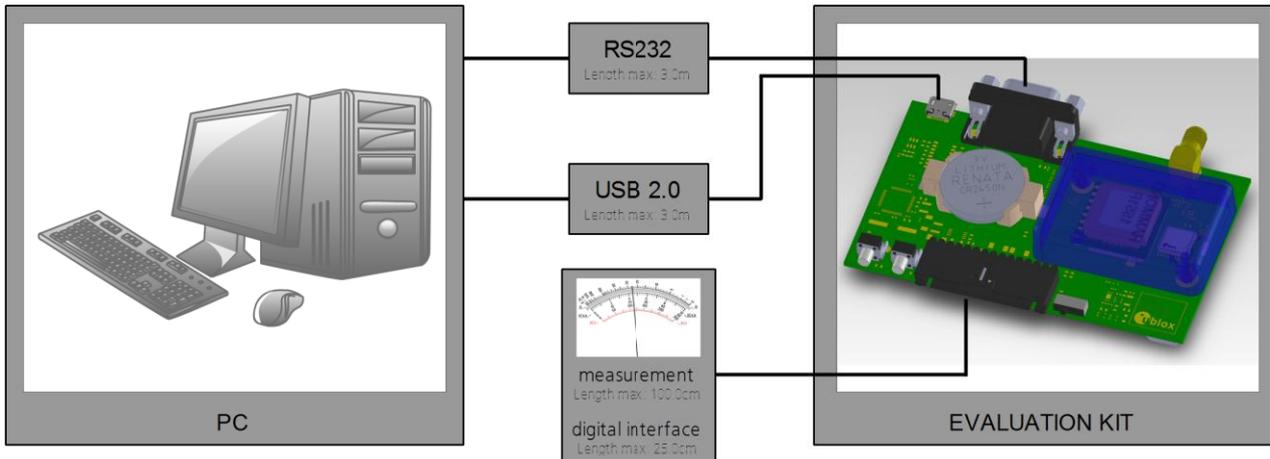
Figure 1: Connecting the unit for power supply and communication

4.2 Active antenna

The CAM-M8Q or CAM-M8C module is embedded with a chip antenna. Additionally, an active GPS / GLONASS / Galileo / BeiDou antenna with 3 m cable is included in the EVK-M8QCAM or EVK-M8CCAM evaluation kit. It is possible to connect external antenna signals of various active GPS / GLONASS / Galileo / BeiDou antennas to the EVK-M8QCAM/M8CCAM evaluation unit through SMA connector.

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

4.3 Evaluation unit

Figure 2 shows the front and the rear sides of the EVK-M8QCAM/M8CCAM evaluation unit.

Figure 2: EVK-M8QCAM/M8CCAM evaluation unit – front and rear sides

4.3.1 Antenna connector

An SMA female jack is available on the rear side (see Figure 2) of the EVK-M8QCAM/M8CCAM evaluation unit for connection with external antenna signals. DC voltage at the RF input is 3.3 V. The internal short circuit protection limits the maximum current to 60 mA.

The CAM-M8Q and CAM-M8C modules have an embedded antenna switch for switching the antenna signal from the embedded antenna to the SMA jack, provided there is > 2 mA bias current load present at the SMA jack (i.e. active antenna). When connecting the SMA jack with simulator signals, such a DC load current (e.g. 10 mA with a 330 Ω load resistor) must be provided externally and decoupled from the RF-signal.

☞   The 30 mA maximum supply current for an active antenna stays the same. This pin is also ESD protected.

⚠   **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 communications and power supply.

4.3.3 UART

The evaluation unit includes an RS232 port for serial communication which is compatible with PC serial ports. In addition to the RS232 communication port, the time pulse 1 signal is available on the DB9 connector (pin 1 or 6).

Connect using a straight RS232 serial cable with male and female connectors to the port on your PC. The maximum cable length is 3 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	GNSS time pulse output
2	TXD, GNSS Transmit Data, serial data to DTE
3	RXD, GNSS Receive Data, serial data from DTE
4	not connected
5	GND
6	GNSS time pulse output
7-9	not connected

Table 4: SUB-D9 Connector pin description for EVK-M8QCAM/M8CCAM

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 the detailed specifications of configurable values. Time pulse is available on the front test connector of EVK-M8QCAM/M8CCAM versions produced August 2017 or later. Please refer to Figure 3 on how to check the production date of your EVK.

Year produced (e.g.15 = 2015)

Month produced (e.g. 09 = September)

Figure 3: EVK-M8QCAM label with the production date circled in red

4.3.5 RST button

The RST button on the front side 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 into safe boot mode. In this mode, the receiver executes only the minimal functionality. 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 needs to be used, the training sequence must 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 side to choose between the RS232 and USB communication ports.

1. RS232 – With this selection, the EVK operates with the RS232 (DB9 – rear side).
2. USB – With this selection, the EVK operates only with the USB 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 4 shows an example of a power supply connected to the test connector by using standard adapter cables from the manufacture Hirschmann. Figure 5 shows an example for overall current measurement.
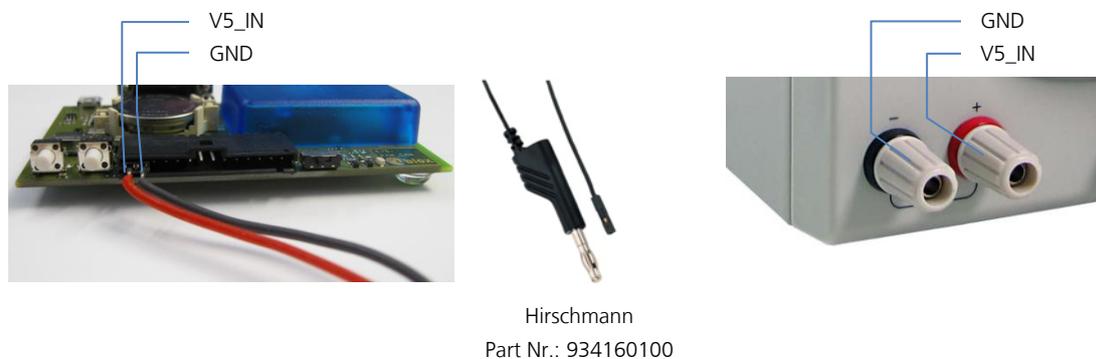

Hirschmann
Part Nr.: 934160100

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 5% resistor for over-all current measurement to pin 11 (P1B)
11	P1B	O		Second connection for over-all current measurement (see Figure 6)
10	P2A	O	3.0 V	Battery output (unloaded) 100 Ω 5% 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	- / 3.3V	Time pulse 1[1]
7	EXTIN0	I	3.3 V	External interrupt input
6	NC	-	-	Not Connected
5	SDA2	I/O	3.3 V	DDC Data
4	SCL2	I/O	3.3 V	DDC Clock
3	TXD1	O	3.3 V	Serial Port
2	RXD1	I	3.3 V	Serial Port
1	GND	I	-	Common ground pin

Table 5: Connector pin description for EVK-M8QCAM/M8CCAM

4.3.9 LED

On the mother board 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.

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

⚠️   **RISK OF SHORT CIRCUIT WHEN TOUCHING THE BATTERY WITH CONDUCTING PARTS!**

4.3.11 GNSS Configuration

The concurrent EVK-M8QCAM and EVK-M8CCAM support the GPS, QZSS, GLONASS, Galileo and BeiDou constellations.

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 [4] and the u-blox 8 / u-blox M8 Receiver Description including Protocol Specification [3].

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

5 Measuring the tracking current

To measure the tracking current with the EVK-M8QCAM or EVK-M8CCAM, 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 of the 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 unobstructed sky views to ensure that the receiver can acquire the satellite signals.

For more details, see the circuit in Figure 8.

Hirschmann
Part Nr.: 934160100
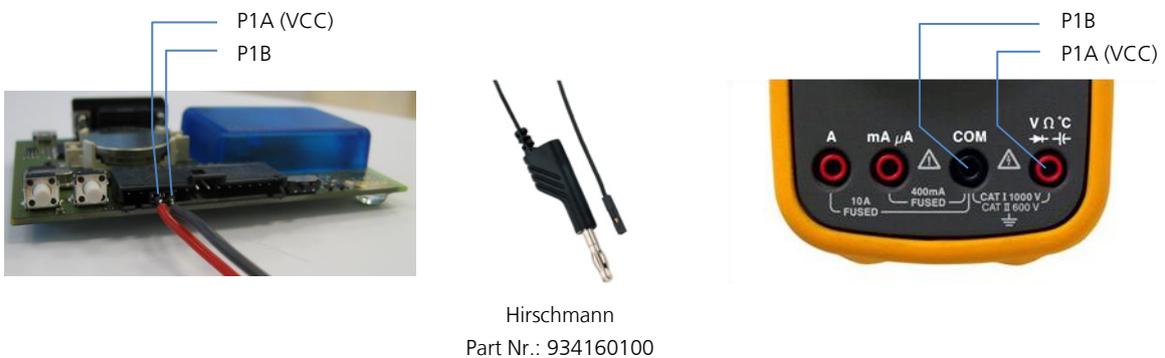
Figure 5: Example – tracking current measurement

6 Testing Power Save Mode

When testing Power Save Mode with the EVK-M8QCAM or EVK-M8CCAM, observe the following points:

- When configuring Power Save Mode, you must set up the parameters using the CFG-PM2 message first and then enable Power Save Mode using CFG-RXM. The Configuration view or Messages view of the u-center evaluation software can be used to do this. When enabling the mode using CFG-RXM, always save the configuration by checking the "save configuration" box in u-center, otherwise the configuration will be lost.

- Communications to the evaluation kit must be via the RS232 or the USB.

- The evaluation kit can be supplied with power via the USB connector or via V5_IN at the front side connector.

- When altering the Power Save Mode configuration, first disable the mode using CFG- RXM (remember to enable "save configuration" again), before changing the CFG-PM2 parameters. Then re-enable Power Save Mode.
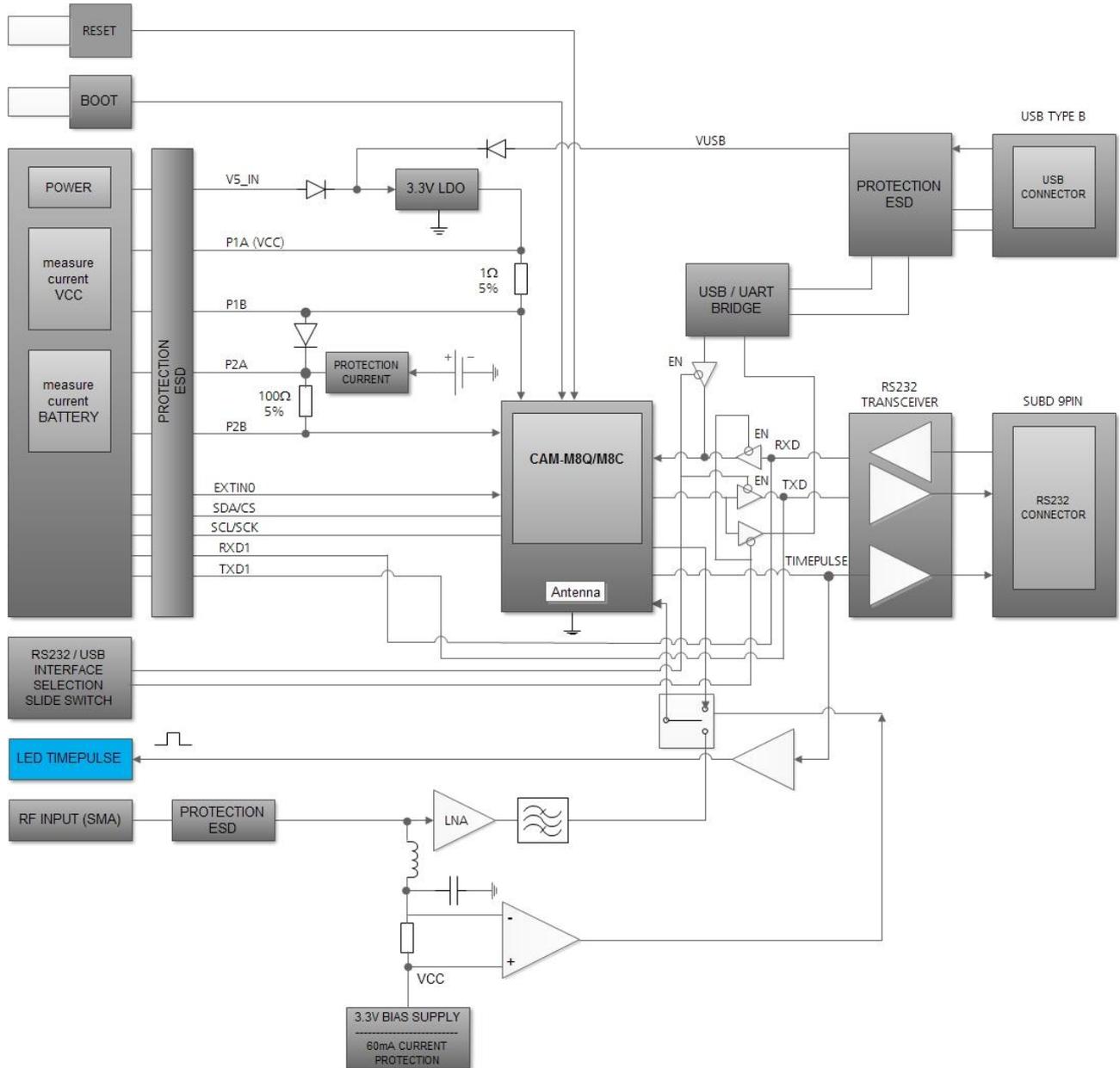
7 Block diagram

Figure 6: EVK-M8QCAM/M8CCAM block diagram

8 Board layout

Figure 7 shows the EVK-M8QCAM/M8CCAM board layout. See Table 6 for the component list of the EVB.
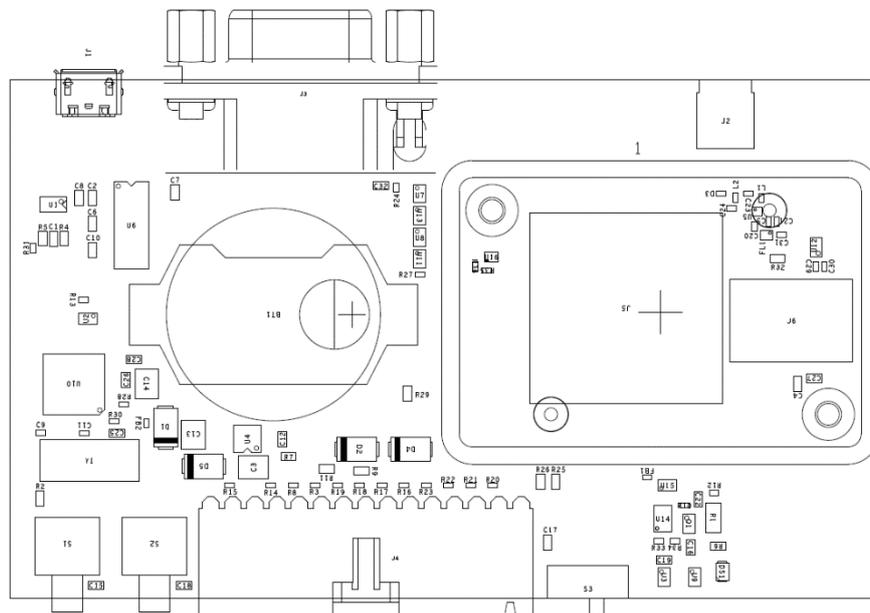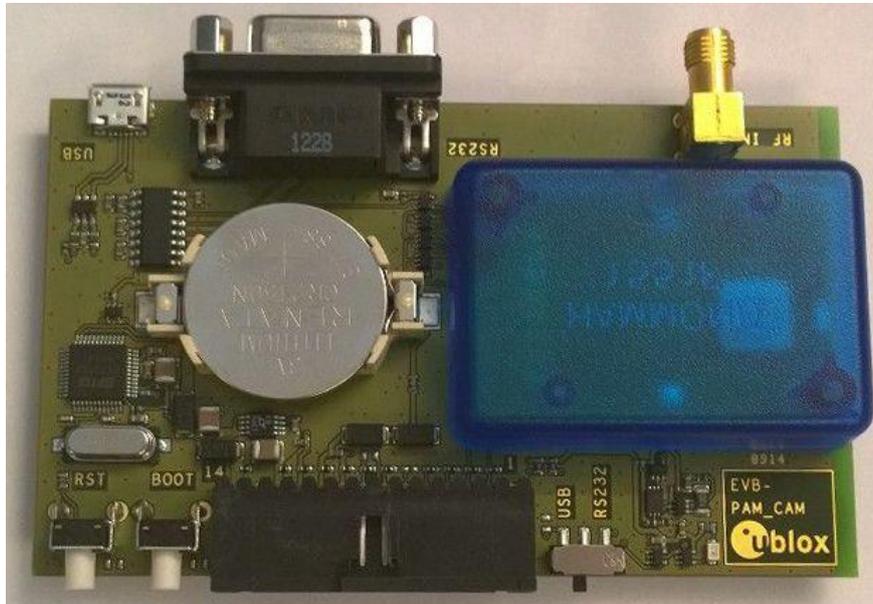

Figure 7: EVB-PAM_CAM layout

PART	DESCRIPTION
1	PLASTIC HOUSING 1551FTBU
BT1	BATTERY HOLDER RENATA CR2450N 3 V
C1 C7 C16 C19 C25 C28 C32	CAP CER X7R 0603 100N 10% 10 V
C5	CAP CER X7R 0402 1N0 10% 16 V
C10 C2 C6 C8 C22	CAP CER X5R 0603 1U0 10% 6.3 V
C12	CAP CER X7R 0603 10N 10% 10 V
C13 C14 C3	CAP CER X5R 1210 10U 10% 10 V
C9 C11	CAP CER COG 0402 27P 5% 25 V
C20	CAP CER COG 0402 1P8 + / - 0.1P 25 V
C21	CAP CER COG 0402 22P 5% 25 V
C23	CAP CER COG 0402 47P 5% 25 V
C24	CAP CER X5R 0402 100N 10% 10 V
C26	CAP CER X7R 0603 33N 10% 25 V
C27 C4	CAP CER X5R 0603 4U7 10% 6.3 V
C29 C30 C31	CAP CER COG 0402 47P 5% 25 V
D1 D2 D4 D5	SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER SS14 1A -55/+125 °C
D3 R17 R18 R20 R21 R22 R23	ESD PROTECTION FOR HIGH SPEED LINES, TYCO, 0.25PF, PESD0402-140 -55/+125 °C
DS1	LED OSRAM HYPER MINI TOPLED LB M673-L1N2-35 BLUE 0.02 A
FB1 FB2	FERRITE BEAD MURATA BLM15HD 0402 1000R @ 100 MHZ
FL1	SAW FILTER FOR GPS/GLONASS MURATA SAFEA1G58KA0F00 -40/+85 °C
J1	CON USB RECEPTACLE MICRO B TYPE SMD - MOLEX 47346-0001 - TID60001597 30 V 1 A
J2	CON SMA THT RIGHT ANGLE JACK
J3	9 POLE SUBD CONNECTOR FEMALE
J4	14PIN 90DEGREE 2.54MM PITCH DISCONNECTABLE CRIMP CONNECTOR -40/+85 °C
J6	SMART ANTENNA MODULES CAM-M8Q or CAM-M8C -40/+85 °C
L1	IND MURATA LQW15A 0402 8N7 3% 0.54A -55/+125 °C
L2	IND MURATA LQW15A 0402 120N 5% 0.64A -55/+125 °C
Q1	MBT3906DW1T1G DUAL GENERAL PURPOSE TRANSISTOR 0.2A 0.15 W -
R1	RES THICK FILM CHIP 1206 10R 5% 0.25 W
R10	RES THICK FILM CHIP 0402 220R 5% 0.1 W
R9	RES THICK FILM CHIP 0603 51R 1% 0.063W. Note: installed only in EVK versions dated 08/17 and later, not installed in earlier EVK versions.
R11 R2 R6	RES THICK FILM CHIP 0603 100R 5% 0.1 W
R12	RES THICK FILM CHIP 0402 2K2 5% 0.1 W
R13	RES THICK FILM CHIP 0402 10K 5% 0.1 W
R14 R15 R19 R3 R8	VARISTOR BOURNS MLE SERIES CG0402MLE-18G 18 V
R24 R27 R34 R35 R36	RES THICK FILM CHIP 0402 100K 5% 0.1 W
R25 R26	RES THICK FILM CHIP 0603 3K0 5% 0.1 W
R28	RES THICK FILM CHIP 0402 10K 1% 0.063 W
R29	RES THICK FILM CHIP 0603 1K0 5% 0.1 W
R30	RES THICK FILM CHIP 0402 470R 5% 0.1 W
R31	RES THICK FILM CHIP 0402 1K5 5% 0.1 W
R33	RES THICK FILM CHIP 0402 1K5 5% 0.1 W
R4 R5	RES THICK FILM CHIP 0603 27R 5% 0.1 W
R7	RES THICK FILM CHIP 0603 1R0 5% 0.1 W

S1 S2	SWITCH SPST ON 1POL TYCO -40/+85 °C
S3	2 WAY SUB-MINIATURE SLIDE SWITCH SMD JS SERIES – SPDT -40/+85 °C
U1	USB DATA LINE PROTECTION ST USBLC6-2SC6 SOT23-6
U10	DUAL USB TO SERIAL BRIDGE CONTROLLER FT2232D
U11 U13	TINY LOGIC UHS BUFFER OE_N ACTIVE LOW FAIRCHILD NC7SZ125 SC70
U12	PHEMT SPDT SWITCH 300KHZ-3GHZ SKYWORKS AS179-92 SC70 -40/+85 °C
U14	PRECISION RAIL TO RAIL OP AMP LINEAR LT6000 DCB
U15	TINY LOGIC UHS INVERTER WITH SCHMITT TRIGGER 0.9 TO 3.6V FAIRCHILD NC7SV14 SC70
U16	TINY LOGIC ULP-A 2-INPUT AND GATE 1.45X1.0 6-LEAD MICROPAK -40/+85 °C
U2 U3 U7 U8 U9	TINY LOGIC UHS BUFFER OE_N ACTIVE LOW FAIRCHILD NC7SZ125 SC70
U4	LOW DROPOUT REGULATOR LINEAR LT1962 MS8 3.3V 0.3 A
U5	LOW NOISE AMPLIFIER GAAS MMIC 1.575 GHZ 1.5V-3.6V JRC EPFFP6-A2 3.6V -40/+85 °C
U6	RS-232 TRANSCEIVER MAXIM MAX3232 SO16 -40/+85 °C
YI	CRYSTAL CL=18PF CITIZEN HCM49 6.0000MHZ 50 PPM

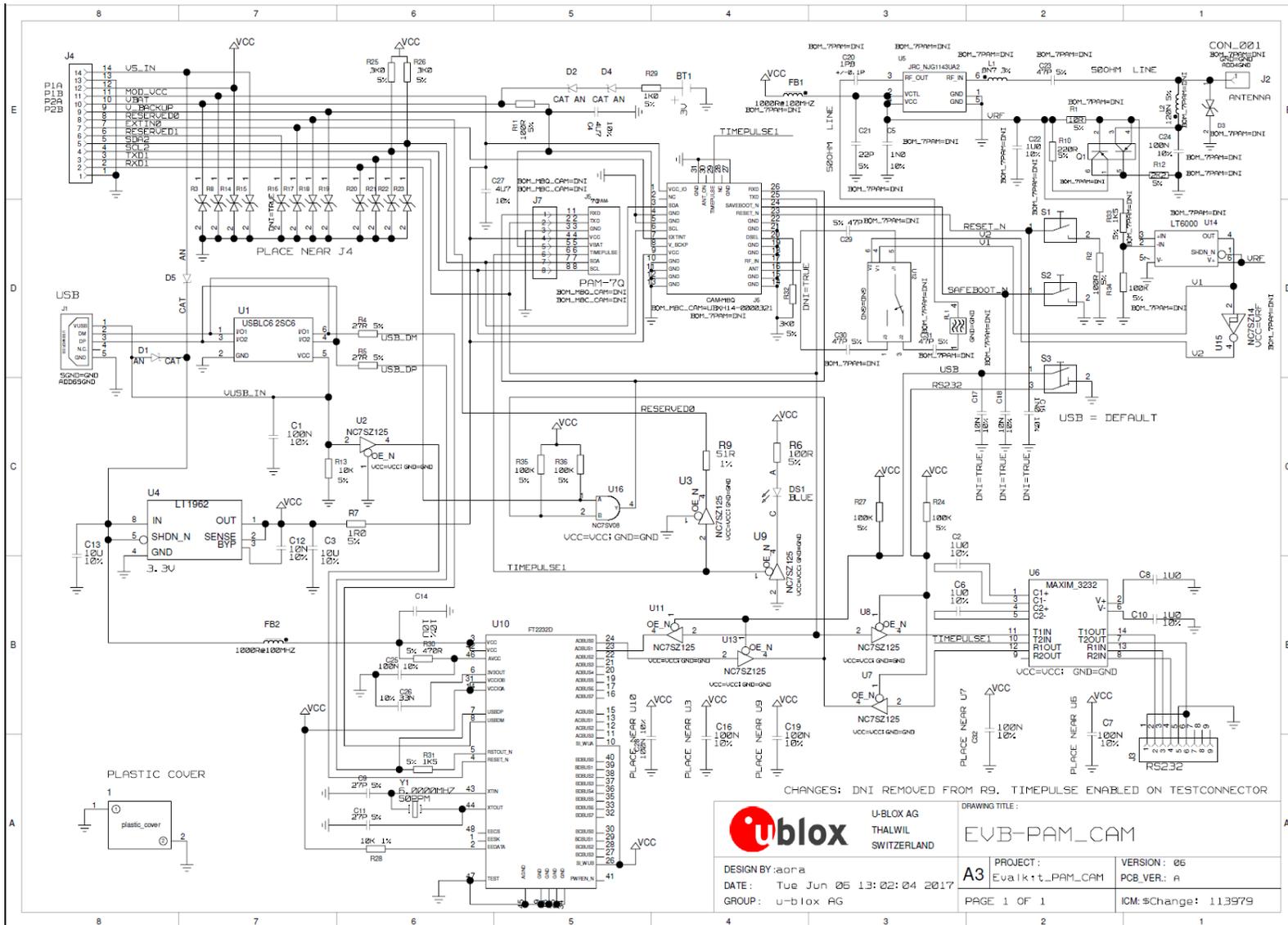**Table 6: EVB-M8QCAM/M8CCAM component list**

9 Schematic

Figure 8: Schematic EVK-7PAM / EVK-M8QCAM / EVK-M8CCAM: DNI=TRUE in the schematic means: Component not installed

10 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 baud, 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 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 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 on the front side is set to RS232 and not USB. In USB Mode, the RS232 pins on the DB9 connector are switched off.

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.

After installing the USB driver for the first time by connecting EVK-M8QCAM/M8CCAM to the PC with USB cable, the cursor on the PC starts to jump around the screen

The syndrome is caused when the NMEA 0183 GNSS serial data is misinterpreted as mouse data by the serial port enumerator (serenum.sys), resulting in erratic mouse cursor activity. Change the USB/RS232 switch to RS232 can help to recover control of the cursor and disable the enumerator setting in the Windows Device Manager / Ports (COM&LPT) / USB Serial Port (COMxx) / Port Settings / Advanced…

The position is off by a few dozen meters

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 the 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 the NMEA protocol, position solutions with high deviations (e.g. due to enabling almanac navigation) can be filtered with the Position Accuracy Mask. The 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) have been exceeded.

TTFF times at startup are much longer than specified

At start-up (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 start-up times.

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

The EVK-M8QCAM/M8CCAM 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.

The EVK-M8QCAM/M8CCAM does not work properly when connected with a GNSS simulator

When using an EVK together with a GNSS simulator, 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 GPS week rollover to 1200 (as indicated in Figure 9), which corresponds to Jan 2003. Then, issue the cold start command before every simulator test to avoid receiver confusion due to the time jumps.

Also ensure that the RF-signal path is switched to the RF-connector. To do this, provide an external DC-load to the RF input, which shall be electrically decoupled from the RF signal.
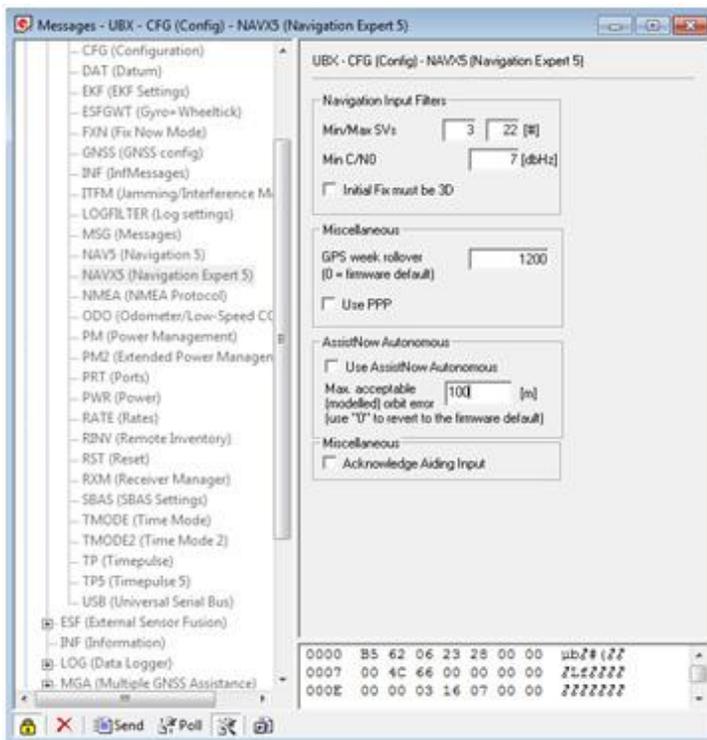

Figure 9: Configuration instruction for using the EVK with a GNSS simulator

The EVK-M8QCAM/M8CCAM does not preserve the configuration when power is cut off

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).

EVK-M8QCAM/M8CCAM receives GPS and GLONASS

Use u-center version 7.02 or newer. Message UBX-CFG-GNSS allows switching on and off the supported GNSS.

11 Common evaluation pitfalls

- A 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 the 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 that 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.

Related documents

[1]   CAM-M8 (FW3) Data Sheet , Docu. No. UBX-15031574

[2]   CAM-M8 (FW3) Hardware Integration Manual, Docu. No. UBX-15030063

[3]   u-blox 8 / u-blox M8 Receiver Description including Protocol Specification, Docu. No. UBX-13003221 (Public Release)

[4]   u-center – User Guide, Docu. No. UBX-13005250

[5]   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.

Revision history

Revision	Date	Name	Status / Comments
R01	13-Jun-2014	julu	Advance Information
R02	22-Aug-2014	julu	Early Production Information
R03	26-Feb-2014	julu	Renamed EVK-M8CAM to EVK-M8QCAM
R04	10-Apr-2015	julu	Added EVK-M8CCAM variant
R05	15-Sep-2016	jhak	Changed product type numbers with ROM SPG 3.01 and updated relevant information.
R06	14-Jun-2017	rmak	Added information on time pulse in sections 2, section 4. Updated BOM in section 8 and Schematic in section 9. Added section 2.1 (Safety Precautions).
R07	30-Nov-2017	msul/rmak	Added information on RED DoC in European Union regulatory compliance (page 2), updated legal statement in cover page and added Documentation feedback e-mail address in contacts page. Removed extra backup battery from EVK content (section 1.2).

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