

EVK-N2xx

SARA-N2 series

Cellular Evaluation Kits

User Guide

Abstract

This guide explains how to set up the EVK-N2xx Evaluation Kits to begin evaluating the u-blox SARA-N2 series cellular modules supporting LTE Cat NB1 radio access technology.



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This document applies to the following products:

Name	Type number
EVK-N200	EVK-N200-00B-00
EVK-N201	EVK-N201-00B-00
EVK-N210	EVK-N210-00B-00
EVK-N280	EVK-N280-00B-00

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1 Starting up

1.1 EVK-N2xx overview

The EVK-N2xx kit is a powerful and easy-to-use tool that simplifies the evaluation of u-blox SARA-N2 series NB-IoT modules.

The following evaluation kits are available with u-blox SARA-N2 cellular modules:

- EVK-N200 evaluation kit is for evaluation of SARA-N200
- EVK-N201 evaluation kit is for evaluation of SARA-N201
- EVK-N210 evaluation kit is for evaluation of SARA-N210
- EVK-N280 evaluation kit is for evaluation of SARA-N280

All the evaluation kits EVK-N200, EVK-N201, EVK-N210 and EVK-N280 are herein identified as EVK-N2xx.

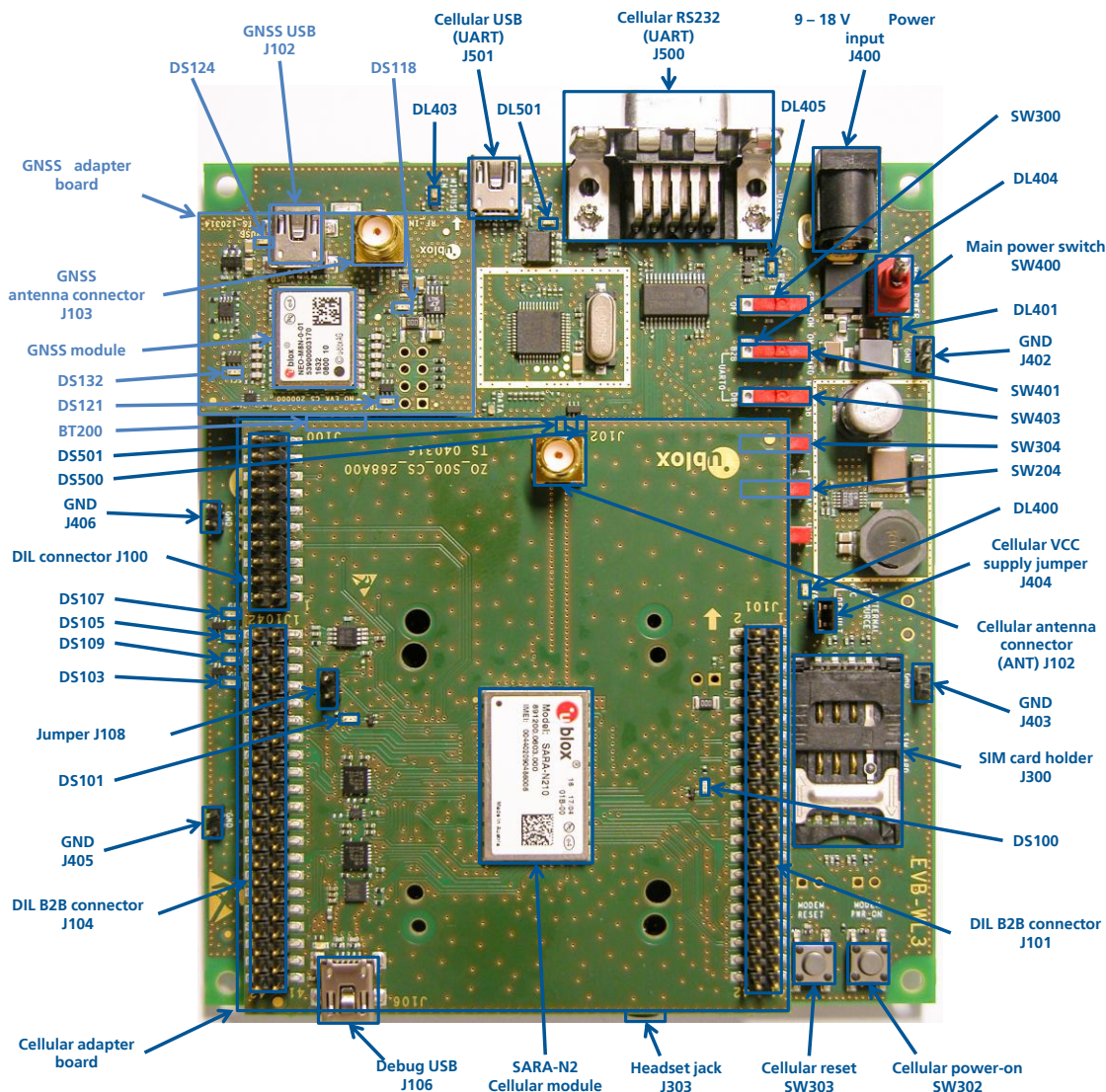


Figure 1: Overview of EVK-N2xx evaluation kit for SARA-N2 modules

1.2 EVK-N2xx block diagram

Figure 2 shows the main interfaces and internal connections of the EVK-N2xx evaluation kit:

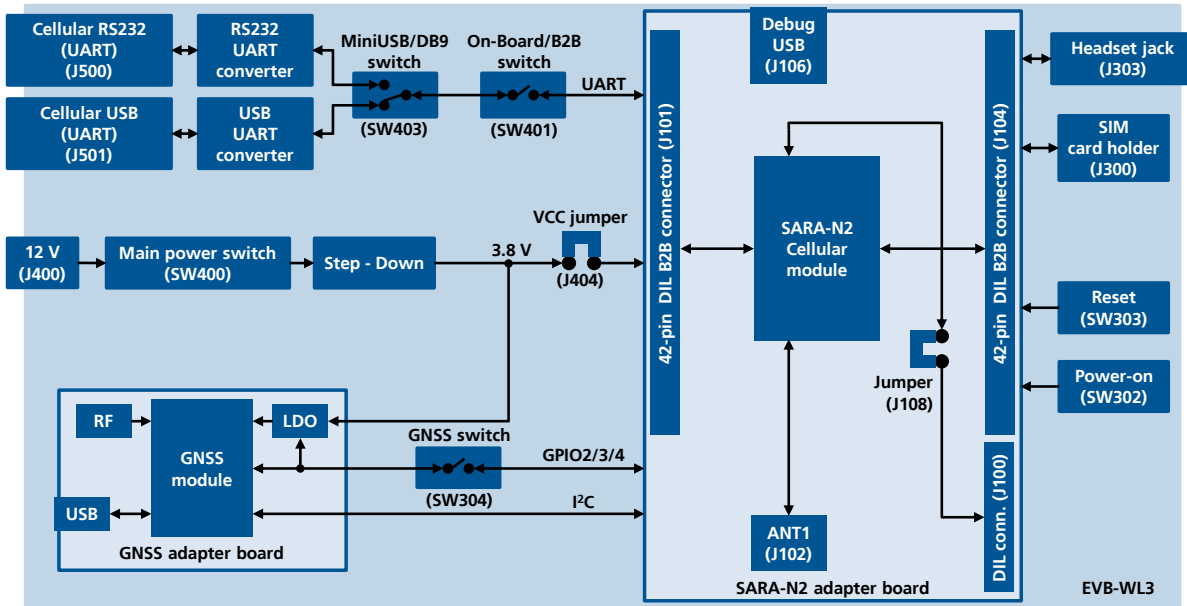


Figure 2: Block diagram of EVK-N2xx for SARA-N2 modules

The EVK-N2xx is formed by three boards:

- The lower one, called EVB-WL3, contains the power supply and other peripherals for the SARA-N2 series cellular module (e.g. SIM card holder and Reset button).
- The cellular adapter board, called ADP-N2xx, contains the SARA-N2xx cellular module, the cellular antenna connector and the DIL connectors (J100, J101 and J104).
- The GNSS adapter board, called ADP-GNSS, contains the u-blox GNSS module, the GNSS antenna connector and the USB connector for the GNSS module.

The boards are connected by means of male header board-to-board connectors provided on the bottom of the adapter boards and their corresponding female connectors provided on top of the lower board.

The SARA-N2 series pins are available on the Dual-In-Line male Board-to-Board connectors provided on the top layer of the cellular Adapter Board (J101 and J104), which are pin-to-pin compatible to the connectors on the bottom layer of the adapter board EVB-WL3.

The DIL connector J100, available on the ADP-N2xx, is used to execute a FW upgrade using the J-Link tool (for more details see the SARA-N2 series System Integration Manual [4]).

Communication with the SARA-N2 module is provided through the Cellular RS232 (J500) or the Cellular USB (J501) connectors, available on the EVB-WL3 board. Both, J500 and J501, are connected to the UART interface of SARA-N2 series module. The mini USB/DB9 switch (SW 403) must be set according with the selected connector interface. The Cellular USB connector (J501) provides also access to the SARA-N2 secondary UART interface (see section 1.8).

The USB connector (J106) mounted on the Adapter Board is used for reserved debug operations only and must be left unconnected.

The lower board (EVB-WL3) is designed also to be used with other u-blox cellular adapter boards. It contains additional switches, jumpers, connectors, LEDs and parts that are partially described in Figure 1 or in this document, because they are intended for use only with other u-blox cellular modules. It is recommended to leave any additional connector unconnected, and any additional switch in its default configuration.

1.3 Switches, jumpers and buttons





Function	Description	Name	Board
Main Power Switch	Power on / off of the whole evaluation kit	SW400	EVB-WL3
Cellular VCC	Jumper socket to provide the 3.8 V supply to the cellular module VCC input	J404	EVB-WL3
Enable trace info over the Cellular Secondary UART	Jumper socket to be used to enable tracing over the second COM port of Cellular USB connector (J501)  Leave the jumper unconnected if not tracing.	J108	ADP-N2xx
FW update with J-Link	Jumper socket to be used during the FW update procedure with the J-Link tool  Leave the jumper unconnected if not upgrading FW with J-Link.	J108	ADP-N2xx
Cellular Power-on	Push button to switch on the cellular module  The functionality of the cellular module switch-on button is not supported on EVK-N2xx.	SW302	EVB-WL3
Cellular Reset	Push button to reset the cellular module	SW303	EVB-WL3
Cellular UART detach	Slide switch to attach / detach cellular module UART from USB / RS232 connectors: when detached, UART signals are available only on DIL B2B connectors on ADP board	SW401	EVB-WL3
Cellular UART routing	Slide switch to select cellular module UART routing on USB or on RS232 connectors	SW403	EVB-WL3
Cellular GPIO detach	Slide switch to attach / detach the cellular module GPIOs, SIM_DET from peripherals: when detached, the signals are available only on the DIL B2B connectors on ADP board	SW300	EVB-WL3
Cellular GNSS detach	Slide switch to attach / detach the cellular module to the GNSS module (GPIO2-3-4): when detached, the signals are available only on DIL B2B connector on ADP board  GNSS control over the cellular module is not supported on SARA-N2 series modules.	SW304	EVB-WL3
GNSS V_BCKP	Slide switch to connect / disconnect backup battery to V_BCKP pin of GNSS module	SW204	EVB-WL3

Table 1: EVK-N2xx switches, jumpers and buttons description

1.4 LEDs


























Function	Description	LED #	Board	Color
Main Power	Power supply plugged in the 9 - 18 V Power Input	DL401	EVB-WL3	
Cellular VCC	Cellular module supplied. Main Power Switch must be switched on	DL400	EVB-WL3	
Cellular USB	USB cable plugged in Cellular USB connector for UART access	DL501	EVB-WL3	
Cellular USB / UART	Green light is activated when UART is routed to Cellular USB connector Red light blinks at UART TX or RX data on Cellular USB connector	DL403	EVB-WL3	
Cellular UART detach	UART signals are available only on the DIL B2B connector on ADP board	DL404	EVB-WL3	
Cellular RS232 / UART	Green light is activated when UART is routed to Cellular RS232 connector Red light blinks at UART TX or RX data on Cellular RS232 connector	DL405	EVB-WL3	
Cellular RI indicator	RI line turns ON (active low)  Not supported on SARA-N2 series.	DS501	EVB-WL3	
Cellular CTS indicator	CTS line turns ON (active low)  Not supported by SARA-N2 series.	DS500	EVB-WL3	
Cellular GPIO1 indicator	Green light is activated when cellular GPIO1 is high  Not supported by SARA-N2 series.	DS107	EVB-WL3	
Cellular GPIO2 indicator	Green light is activated when cellular GPIO2 is high  Not supported by SARA-N2 series.	DS105	EVB-WL3	
Cellular GPIO3 indicator	Green light is activated when cellular GPIO3 is high  Not supported by SARA-N2 series.	DS109	EVB-WL3	
Cellular GPIO4 indicator	Green light is activated when cellular GPIO4 is high  Not supported by SARA-N2 series.	DS103	EVB-WL3	
SIM supply	Green light is activated when the VSIM line is at a "high" level	DS100	ADP-N2xx	
V_INT supply	Green light is activated when the V_INT line is at a "high" level	DS101	ADP-N2xx	
GNSS VCC supply	GNSS module supply is turned ON	DS118	ADP-GNSS	
GNSS USB	USB cable plugged in GNSS USB connector	DS124	ADP-GNSS	
GNSS Timepulse	Pulses at 1 Hz when valid GNSS fix	DS121	ADP-GNSS	
Cellular / GNSS DDC	Cellular / GNSS module communication over DDC (I ² C) interface  Not supported by SARA-N2 series.	DS132	ADP-GNSS	

Table 2: EVK-N2xx LEDs description

1.5 Connectors





Function	Description	Name	Board
9 - 18 V Power Input	Connector for the AC / DC power adapter of the EVK AC: 100-240 V, 0.8 A, 50-60 Hz / DC: +12 V, 2.5 A 	J400	EVb-WL3
SIM card holder	SIM card holder	J300	EVb-WL3
Cellular antenna	SMA connector for the module cellular antenna ANT	J102	ADP-N2xx
Cellular USB (UART)	Mini USB connector for cellular module UART interfaces converted as USB interface  The SARA-N2 primary UART interface is available over the first numbered COM port. The secondary UART interface, used to collect trace files, is available over the second numbered COM port	J501	EVb-WL3
Cellular RS232 (UART)	DB9 connector for cellular module primary UART interface converted as RS232 interface	J500	EVb-WL3
DIL B2B headers	Dual-In-Line Board-to-Board connectors for cellular module interfaces	J101-J104	ADP-N2xx
DIL header	Dual-In-Line connector for the FW upgrade using the J-Link tool	J100	ADP-N2xx
Cellular headset	Audio headset jack connector for cellular module audio interface  Audio interface not available on SARA-N2 series	J303	EVb-WL3
GNSS antenna	SMA connector for the GNSS module antenna (GNSS Antenna)	J103	ADP-GNSS
GNSS USB	Mini USB connector for GNSS module USB interface	J102	ADP-GNSS
GNSS backup battery	Backup battery socket for the GNSS module (under GNSS adapter board)	BT200	EVb-WL3
GND	Ground terminals for probe reference	J402, J403 J405, J406	EVb-WL3

Table 3: EVK-N2xx connector description

 **CAUTION! 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 BATTERY. REPLACE BATTERY WHEN IT NO LONGER HAS SUFFICIENT CHARGE FOR UNIT OPERATION. CONTROL THE BATTERY BEFORE USE IF THE DEVICE HAS NOT BEEN USED FOR AN EXTENDED PERIOD OF TIME.**

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

1.6 EVK-N2xx pin out

1.6.1 EVK-N2xx for SARA-N2 series modules

SARA-N2 series		DIL B2B	SARA-N2 series		DIL B2B
Pin N°	Name	Name / Pin N°	Pin N°	Name	Name / Pin N°
1	GND	J104 Pins 7-10	33	RSVD	Not present
2	RSVD	Not present	34	SPI_MISO	J101 Pin 38
3	GND	J104 Pins 7-10	35	SPI_MOSI	J101 Pin 39
4	V_INT	Not present	36	SPI_SCLK	J101 Pin 40
5	GND	J104 Pins 7-10	37	SPI_CS	J101 Pin 41
6	RSVD	Not present	38	SIM_CLK	J101 Pin 15
7	RSVD	Not present	39	SIM_IO	J101 Pin 14
8	RSVD	Not present	40	SIM_RST	J101 Pin 16
9	RSVD	Not present	41	VSIM	J101 Pin 13
10	RTS	J104 Pin 13 ¹	42	RSVD	Not present
11	CTS	J104 Pin 14 ¹	43	GND	J104 Pins 7-10
12	TXD	J104 Pin 15 ¹	44	RSVD	Not present
13	RXD	J104 Pin 16 ¹	45	RSVD	Not present
14	GND	J104 Pins 7-10	46	RSVD	Not present
15	RSVD	Not present	47	RSVD	Not present
16	GPIO1	J104 Pin 20 ²	48	RSVD	Not present
17	RSVD	Not present	49	RSVD	Not present
18	RESET_N	Not present	50	GND	J104 Pins 7-10
19	RSVD	Not present	51	VCC	J101 Pins 7-10
20	GND	J104 Pins 7-10	52	VCC	J101 Pins 7-10
21	GND	J104 Pins 7-10	53	VCC	J101 Pins 7-10
22	GND	J104 Pins 7-10	54	GND	J104 Pins 7-10
23	RSVD	Not present	55	GND	J104 Pins 7-10
24	GPIO2	J104 Pin 19 ²	56	ANT	Not present
25	RSVD	Not present	57	GND	J104 Pins 7-10
26	SDA	J101 Pin 21	58	GND	J104 Pins 7-10
27	SCL	J101 Pin 20	59	GND	J104 Pins 7-10
28	RSVD	Not present	60	GND	J104 Pins 7-10
29	RSVD	Not present	61	GND	J104 Pins 7-10
30	GND	J104 Pins 7-10	62	ANT_DET	Not present
31	RSVD	Not present	63	GND	J104 Pins 7-10
32	GND	J104 Pins 7-10	64	GND	J104 Pins 7-10

Table 4: Interfaces of SARA-N2 series modules, as routed on the 42-pin Dual-In-Line Board-to-Board connectors (J200, J201) available on the adapter board ADP-N2xx of the EVK-N2xx evaluation kit

¹ Working at a 1.8 V voltage level domain

² Working at a 1.8 V voltage level domain and available only when jumper J108 is connected

DIL B2B J401				DIL B2B J101			
Signal Name	Pin N°	Pin N°	Signal Name	Signal Name	Pin N°	Pin N°	Signal Name
Not connected	2	1	GND	Not connected	2	1	GND
Not connected	4	3	Reserved	Not connected	4	3	Not connected
Not connected	6	5	Not connected	Not connected	6	5	Not connected
GND	8	7	GND	VCC	8	7	VCC
GND	10	9	GND	VCC	10	9	VCC
Reserved	12	11	Reserved	Not connected	12	11	Not connected
CTS ¹	14	13	RTS ¹	SIM_IO	14	13	VSIM
RXD ¹	16	15	TXD ¹	SIM_RST	16	15	SIM_CLK
Reserved	18	17	Reserved	Not connected	18	17	Not connected
GPIO1 ²	20	19	GPIO2 ²	SCL	20	19	Not connected
Reserved	22	21	Reserved	Not connected	22	21	SDA
Reserved	24	23	Reserved	Not connected	24	23	Not connected
Not connected	26	25	Reserved	RESET_N	26	25	Reserved
Reserved	28	27	Not connected	Reserved	28	27	Reserved
Not connected	30	29	Reserved	Not connected	30	29	Not connected
Reserved	32	31	Reserved	Not connected	32	31	Not connected
Not connected	34	33	Reserved	Reserved	34	33	Reserved
Reserved	36	35	Not connected	Not connected	36	35	Reserved
Not connected	38	37	Not connected	SPI_MISO	38	37	Reserved
Not connected	40	39	Not connected	SPI_CLK	40	39	SPI_MOSI
GND	42	41	Not connected	GND	42	41	SPI_CS

Table 5: Pin-out of the 42-pin Dual-In-Line Board-to-Board connectors (J101, J104) available on the adapter board ADP-N2xx of the EVK-N2xx evaluation kit



The pins / interfaces that are not supported by a specific SARA-N2 module product version should be not driven by an external device; see the SARA-N2 series Data Sheet [2] for the list of features supported by each SARA-N2 module product version.

1.7 Software installation

The USB drivers are available with the EVK-N2xx. Executable files can be downloaded from www.u-blox.com/evk-downloads and saved to any location on the computer hard drive. The installation can be started by running the executable file on a computer with the Windows operating system.

1.8 Board setup

1. Insert a SIM card into the **SIM card holder** (J300 on the EVB).
2. Connect a cellular antenna (provided with the evaluation kit) to the **Cellular antenna** SMA connector on the ADP-N2xx (ANT, RF input/output for transmission and reception of NB-IoT RF signals)
3. If the GNSS functionality is required, connect the GNSS antenna provided with the evaluation kit to the **GNSS antenna** SMA connector on the ADP-GNSS. Place the GNSS antenna in a location with good sky view.



Interface to the GNSS module is not supported by SARA-N2 series modules.

4. Connect the AC / DC +12 V power adapter provided with the evaluation kit to **9 – 18 V Power Input** connector (J400 on the EVB). LED DL401 lights blue.
5. Be sure to provide a jumper socket on the **Cellular VCC supply jumper** (J404 on the EVB). This provides the connection from the output of the supply circuit on the EVB board to the VCC input of the module.
6. To enable the board power supply, turn the **Main power switch** (SW400 on the EVB) to the ON position. LED DL400 lights green. The cellular module switches on.
7. For communication via the cellular module's UART interface, the following connections are allowed and can be alternatively enabled in a mutually exclusive way (see Table 6 for switch position and LED status):
 - a. Connect a USB cable to mini USB connector (**Cellular USB**, J501 on EVB), LED DL501 lights blue
 - b. Connect an RS232 cable to DB9 connector (**Cellular RS232**, J500 on EVB)

When a USB cable is connected to the mini USB connector, two COM ports are enabled in Windows (the numbering of the COM ports can be seen via the Windows Device Manager). The serial port for AT commands is available over the first numbered COM port opened by the driver.

Type of connections	SW401	SW403	LED
Access to cellular UART over the Cellular USB (UART) mini USB connector (J501)	ON BOARD	MINIUSB	DL403
Access to cellular UART over the Cellular RS232 (UART) DB9 connector (J500)	ON BOARD	DB9	DL405
Access to cellular UART on DIL Board-to-Board connector on the adapter board: cellular UART detached from USB (UART) J501 and RS232 (UART) J500 connectors	B2B	Do not care	DL404

Table 6: Serial interface configuration

Run an AT terminal application (e.g. the u-blox m-center tool) selecting an AT port with these settings:

- Data rate: 9600 b/s
- Data bits: 8
- Parity: N
- Stop bits: 1
- Flow control: None

8. It is possible to access SARA-N2 module's secondary UART interface to collect traces. To do so
 - a. Provide connection on the jumper J108
 - b. Connect a USB cable to the mini USB connector (Cellular USB, J501 on EVB), LED DL501 lights blue
 - c. When a USB cable is connected to the mini USB connector, two COM ports are enabled in Windows (the numbering of the COM ports can be seen via the Windows Device Manager). The secondary UART used to collect trace files is available over the second numbered COM port opened by the driver.
 - d. Run an AT terminal application (e.g. the u-blox m-center tool) with the following settings:
 - o Data rate: 921600 b/s
 - o Data bits: 8
 - o Parity: N
 - o Stop bits: 1
 - o Flow control: None



In case tracing is required, make sure the switch SW403 is set to select cellular module UART routing on USB (mini USB connector J501). According with this procedure, the AT communication with the module is forced over the same mini USB connector J501 (primary COM port)

See Appendix A for how to configure the u-blox m-center AT terminal for Windows.

B AT commands examples

For the complete description and syntax of the AT commands supported by SARA-N2 series modules, see the SARA-N2 series AT commands Manual [1].

For detailed AT commands examples for network registration and configuration, context activation, data connection management, SIM management, module interfaces configurations and other settings, see the u-blox NB-IoT system User Guide [3].

C Current consumption measurement

Current consumption of SARA-N2 series modules can be measured on the EVK-N2xx by removing the jumper socket from the **Cellular VCC supply jumper** (J404 on the EVB), as shown in Figure 5.



EVK-N2xx evaluation boards are not optimized to measure extremely low current consumption values (i.e. below 1 mA) like the values reached by SARA-N2 modules in deep-sleep mode, due to the presence of additional circuitry mounted on the ADP-N2xx adapter board.

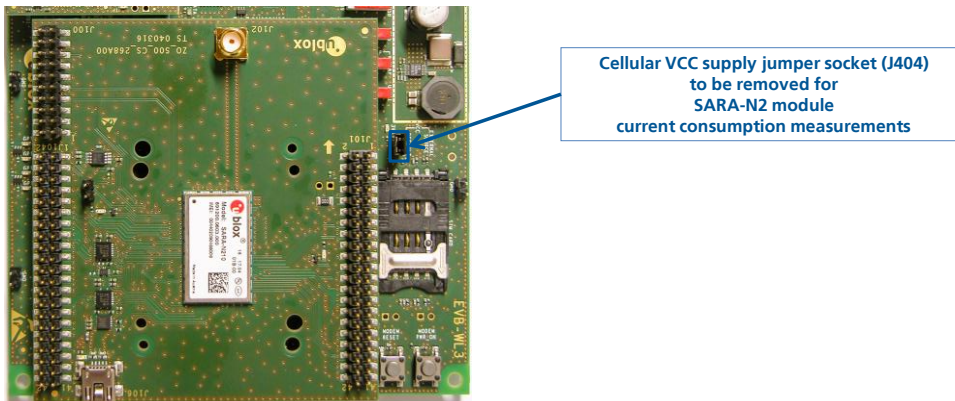


Figure 5: Jumper socket to be removed for SARA-N2 modules current consumption measurement

A suitable external digital multi-meter (as for example the Agilent 34410A or 34411A) can be used for current consumption measurements: in this case the supply circuit on the EVB will supply the SARA-N2 module mounted on the adapter board, with the digital multi-meter placed in series as described in Figure 6.

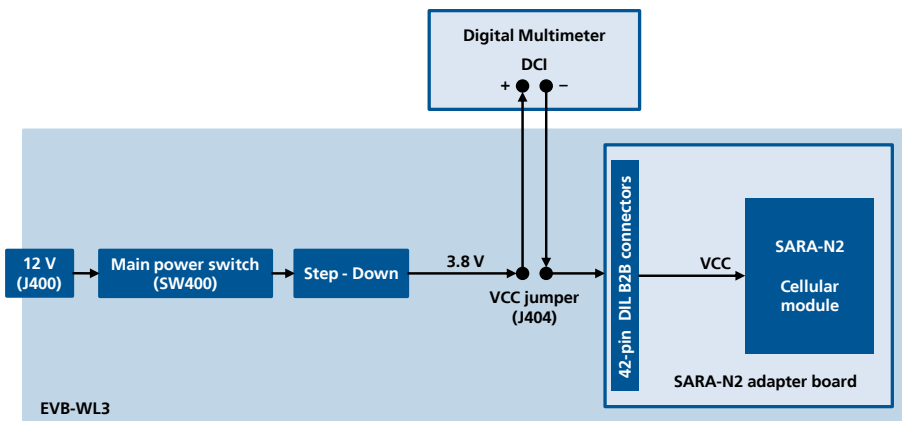


Figure 6: Block diagram of current consumption setup for SARA-N2

Alternatively, a suitable external DC power supply with dynamic current measurement capabilities (as for example the Agilent 66319B/D) can be used for current consumption measurements, acting also as supply source for the SARA-N2 module mounted on the adapter board.

Declaration of conformities

The equipment is intended for indoor usage. It is the user's duty to verify if further restrictions apply, such as in airplanes, hospitals or hazardous locations (petrol stations, refineries...).

Any changes or modification made to this equipment will void its compliance to the safety requirements.

Maintenance, inspections and/or repairs of the EVK-N2xx shall be performed by u-blox AG.

Related documents

- [1] u-blox SARA-N2 AT commands manual, Docu No UBX-16014887
- [2] u-blox SARA-N2 series Data Sheet, Docu No UBX-15025564
- [3] u-blox NB-IoT System User Guide, Docu No UBX-16017368
- [4] u-blox SARA-N2 series System Integration Manual, Docu No UBX-17005143

All these documents are available on request. Contact u-blox technical support for more details.



For regular updates to u-blox documentation and to receive product change notifications, register on our website.

Revision history

Revision	Date	Name	Comments
R01	22-Feb-2017	sfal	Initial release

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