RE866
Evaluation Kit User Guide

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APPLICABILITY TABLE

PRODUCTS

- RE866A1-EU
- RE866A1-NA

CONTENTS

1. INTRODUCTION

1.1. Scope

This document describes the first steps for using the RE866 Evaluation Kit.

1.2. Audience

This document is intended for Telit customers, especially system integrators, about to implement the RE866 in their application.

1.3. Contact and Support Information

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-SRD@telit.com

Alternatively, use:

https://www.telit.com/contact-us

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

https://www.telit.com

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- [1] RE866 Hardware User Guide, 1VV0301364 (EU), 1VV0301525 (NA)
- [2] RE866 AT Command Reference, 80555ST10865A

2. PACKAGE CONTENT

The RE866 Evaluation Kit package contains the following components:

- 1 x RE866 Evaluation Kit board
- 1 x Mini USB cable
- 1 x LoRa antenna

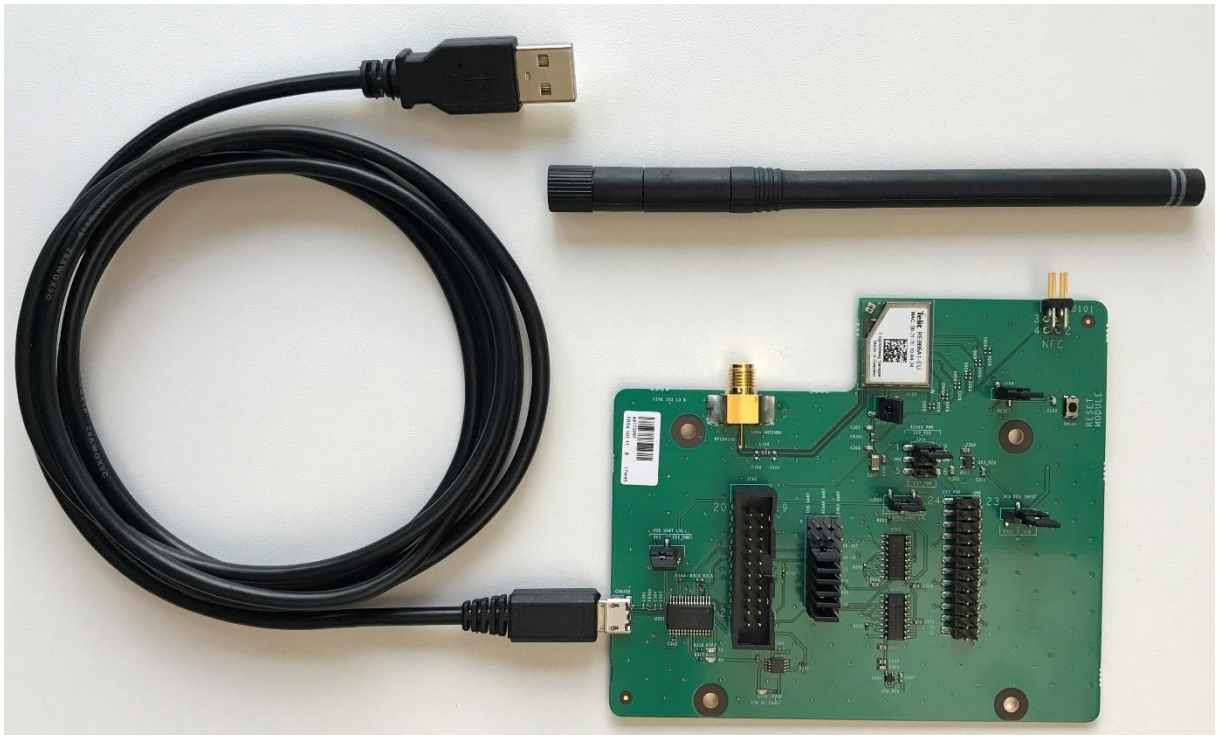


Figure 1: RE866 Evaluation Kit package content

3. HARDWARE

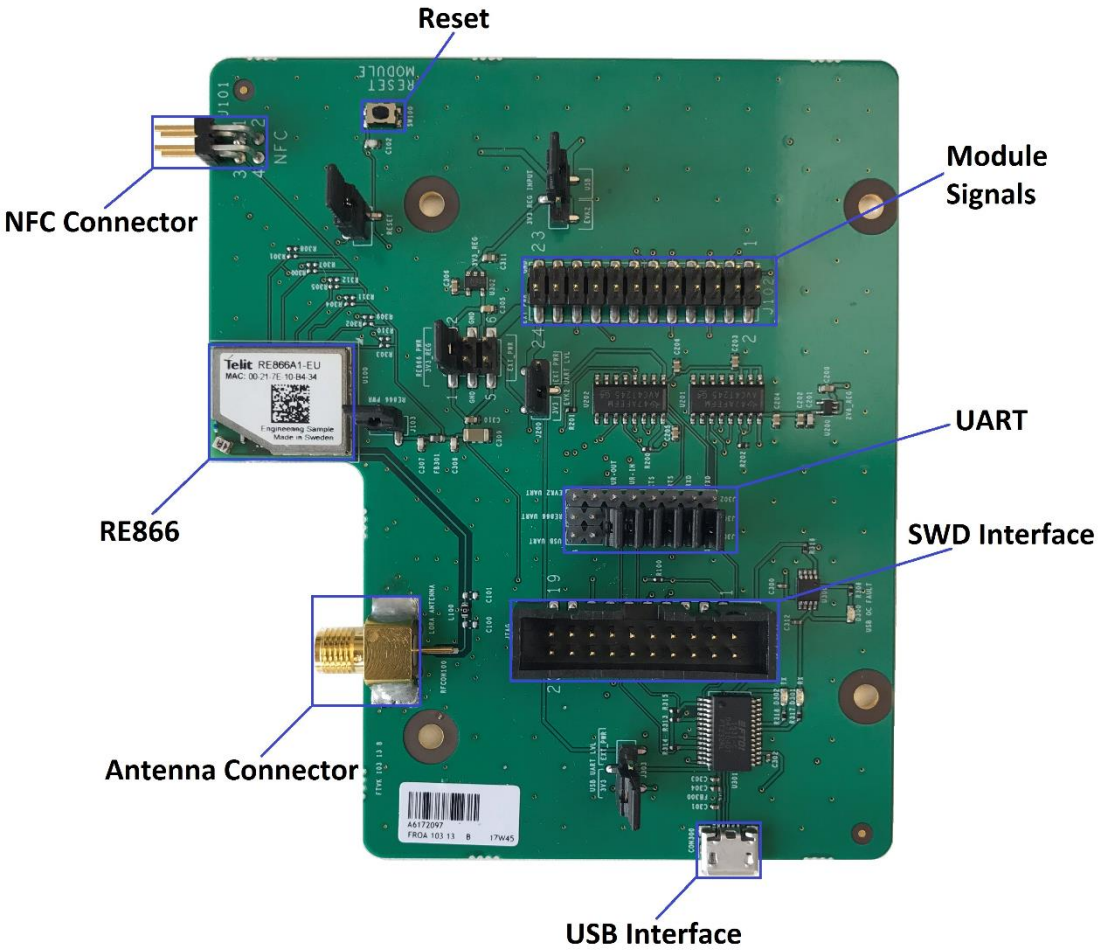


Figure 2: RE866 Evaluation Kit board

3.1. RE866

The RE866 Evaluation Kit board is equipped with a RE866 module.

3.2. USB Interface

The RE866 Evaluation Kit board provides an USB interface which is used to connect the evaluation board to the host and as power supply.

The USB interface is equipped with an FTDI USB to serial bridge, interfacing the serial port of the RE866.

For details please refer to the RE866 Hardware User Guide [1].

3.3. Antenna Connector

The RE866 Evaluation Kit board provides an SMA connector to connect the antenna for LoRa® (included in the package).

3.4. Reset

The RE866 Evaluation Kit board is equipped with a reset button. Pressing the reset button (if jumper J104 is closed) will trigger the RE866 module to perform a reset. The USB port is not influenced by the reset.

3.5. LEDs

The RE866 Evaluation Kit board provides three LEDs for functional indication.

Interface	Position	Function
LEDs	D300	USB overcurrent indication
	D301	Rx traffic indication
	D302	Tx traffic indication

3.6. Connectors / Jumpers

3.6.1. Connector J100 (SWD Interface)

Connector J100 provides the SWD interface.

3.6.2. Connector J101 (NFC Connector)

Connector J101 provides the possibility to connect an NFC antenna.

3.6.3. Connector J102

Connector J102 is a 24-pin extension header exposing all module signals.

Please refer to the table which belongs to the firmware you are using. The LoRa+Bluetooth table below describes all pins. In the following sections only the subset of changed pins is described.

3.6.3.1. LoRa+Bluetooth

Pin Number	Signal	Type Normal	Type UICP	Description
1	Reserved			Reserved
2	-	NC	NC	Not connected
3	Reserved			Reserved
4	GND	PWR	PWR	Ground
5	BOOT0	I-PD	DIS	Boot0
6	TESTMODE#	I-PU	DIS	Testmode
7	GND	PWR	PWR	Ground
8	GND	PWR	PWR	Ground
9	TWI-SDA	DIS	DIS	Two wire interface (1)
10	TWI-SCL	DIS	DIS	Two wire interface (1)
11	-	NC	NC	Not connected
12	RESET#	I	I	User reset
13	GND	PWR	PWR	Ground
14	GND	PWR	PWR	Ground

Pin Number	Signal	Type Normal	Type UICP	Description
15	UART-TXD	I	I	UART data in
16	UART-RXD	O-PP	O-PP	UART data out
17	UART-RTS#	I-PD	I-PD	Flow control / IUC-IN
18	UART-CTS#	O-PP	O-PP	Flow control / IUC-OUT
19	IUR-OUT#	DIS	O	UICP Control
20	IUR-IN#	DIS	I	UICP Control
21	Reserved			Reserved
22	Reserved			Reserved
23	GND	PWR	PWR	Ground
24	EXT_PWR	PWR	PWR	

PU = PullUp, PD = PullDown, PP = PushPull, DIS = Disconnected

(1) Function depending on firmware support

3.6.3.2. LoRa+Lua

In LoRa+Lua firmware UICP is not supported.

Pin Number	Signal	Type	Description
1	DIO1	I/O	Digital in-/output 1
3	DIO2 AIN1	I/O Analog	Digital in-/output 2 Analog input 1
9	DIO6 TWI-SDA	I/O I/O	Digital in-/output 6 Two wire interface
10	DIO5 TWI-SCL	I/O O	Digital in-/output 5 Two wire interface
19	DIO3 AIN2	I/O Analog	Digital in-/output 3 Analog input 2
20	DIO4 AIN3	I/O Analog	Digital in-/output 4 Analog input 3

Note: For all other pins which are not listed here see 3.6.3.1 LoRa+Bluetooth.

3.6.4. Jumper J103

Jumper J103 provides the possibility to measure the supply current of the RE866 module. Close the jumper for normal operation.

3.6.5. Jumper J104

Jumper J104 provides the possibility to reset the RE866 module via the RESET button mounted on the RE866 Evaluation Kit board. Close the jumper to connect the RESET button to the RESET pin of the RE866 module.

3.6.6. Jumper J200

Jumper J200 provides the possibility to select the UART level converter voltage. Set jumper J200 to position 3V3 for originating voltage from RE866 Evaluation Kit board.

3.6.7. Jumper J300, 301, 302

Jumpers J300, J301 and J302 provides the possibility to connect the RE866 UART lines to USB UART or EVK2 UART. To connect the RE866 UART lines to USB UART set the jumpers as follows.

Position	Function
J300-1 to J301-1	TXD
J300-2 to J301-2	RXD
J300-3 to J301-3	RTS
J300-4 to J301-4	CTS
J300-5 to J301-5	IUR-IN
J300-6 to J301-6	IUR-OUT

3.6.8. Jumper J303

Jumper J303 provides the possibility to select the USB UART level voltage. Set jumper J303 to position 3V3 for originating voltage from RE866 Evaluation Kit board.

3.6.9. Jumper J304

Jumper J304 provides the possibility to select the power source for the RE866 module. Set the jumper to position 1-2 to use 3V3 regular input voltage.

3.6.10. Jumper J305

Jumper J305 provides the possibility to select the 3V3 regular input voltage. Set jumper J305 to position USB to use 3V3 from USB interface.

3.7. Default Configuration

The RE866 Evaluation Kit board is preconfigured for using USB interface.

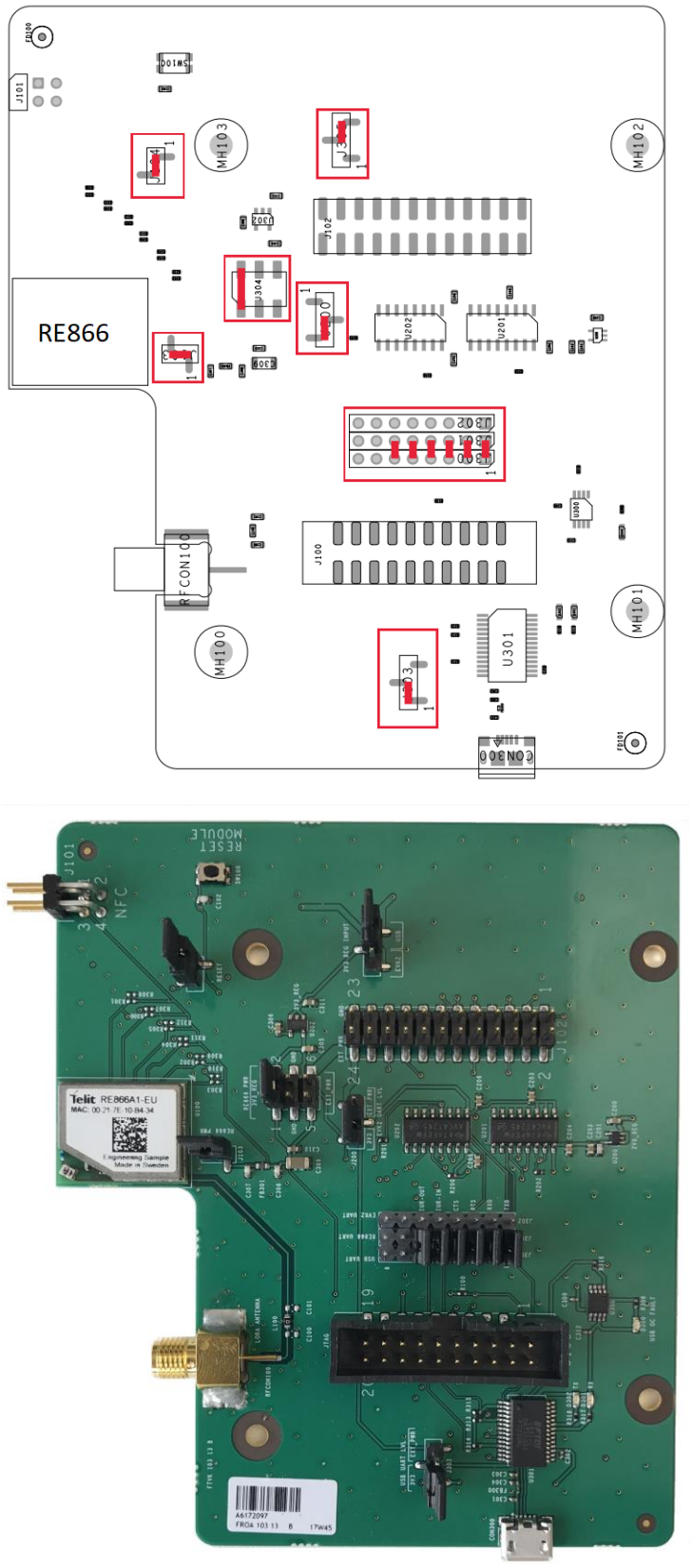
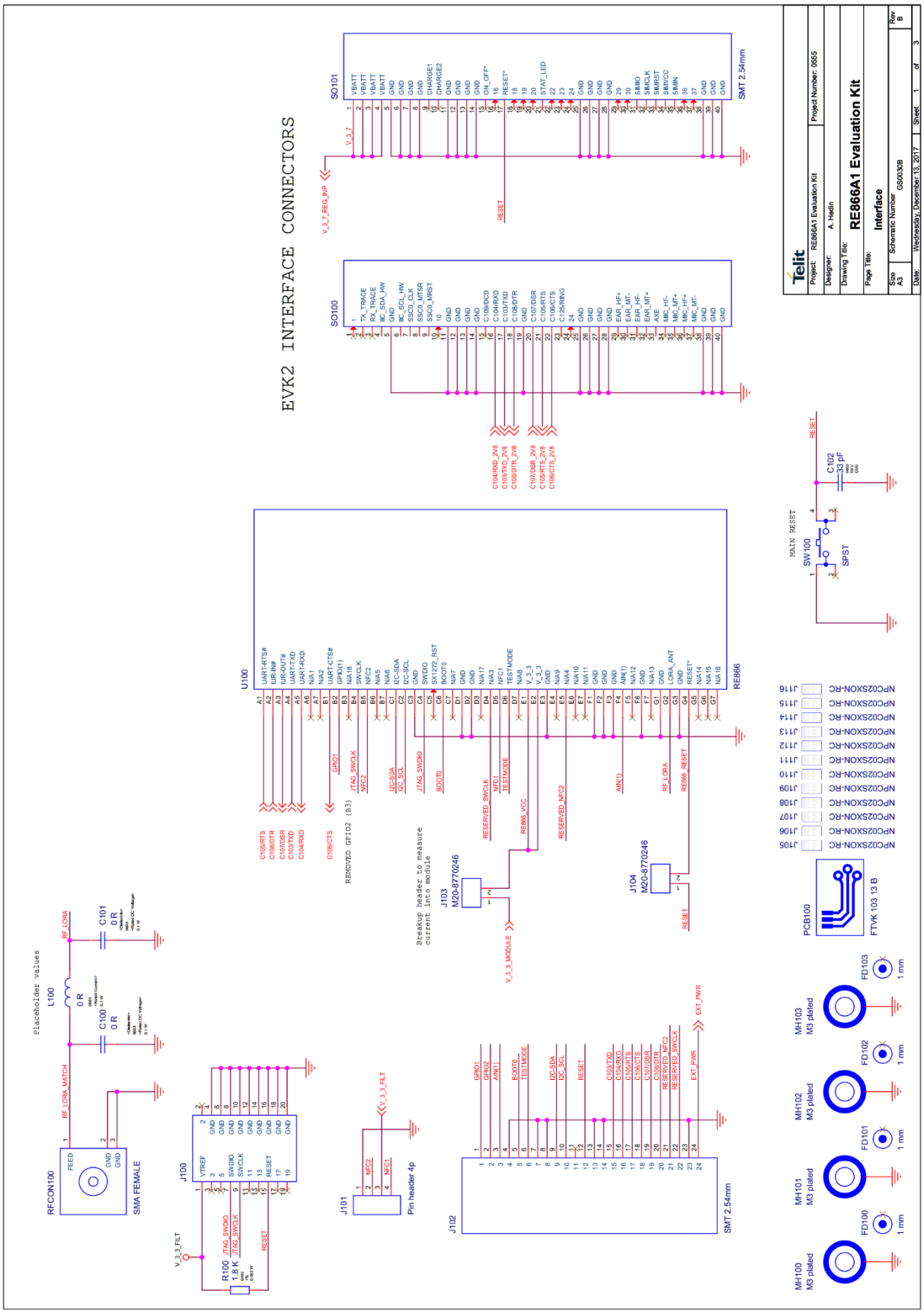
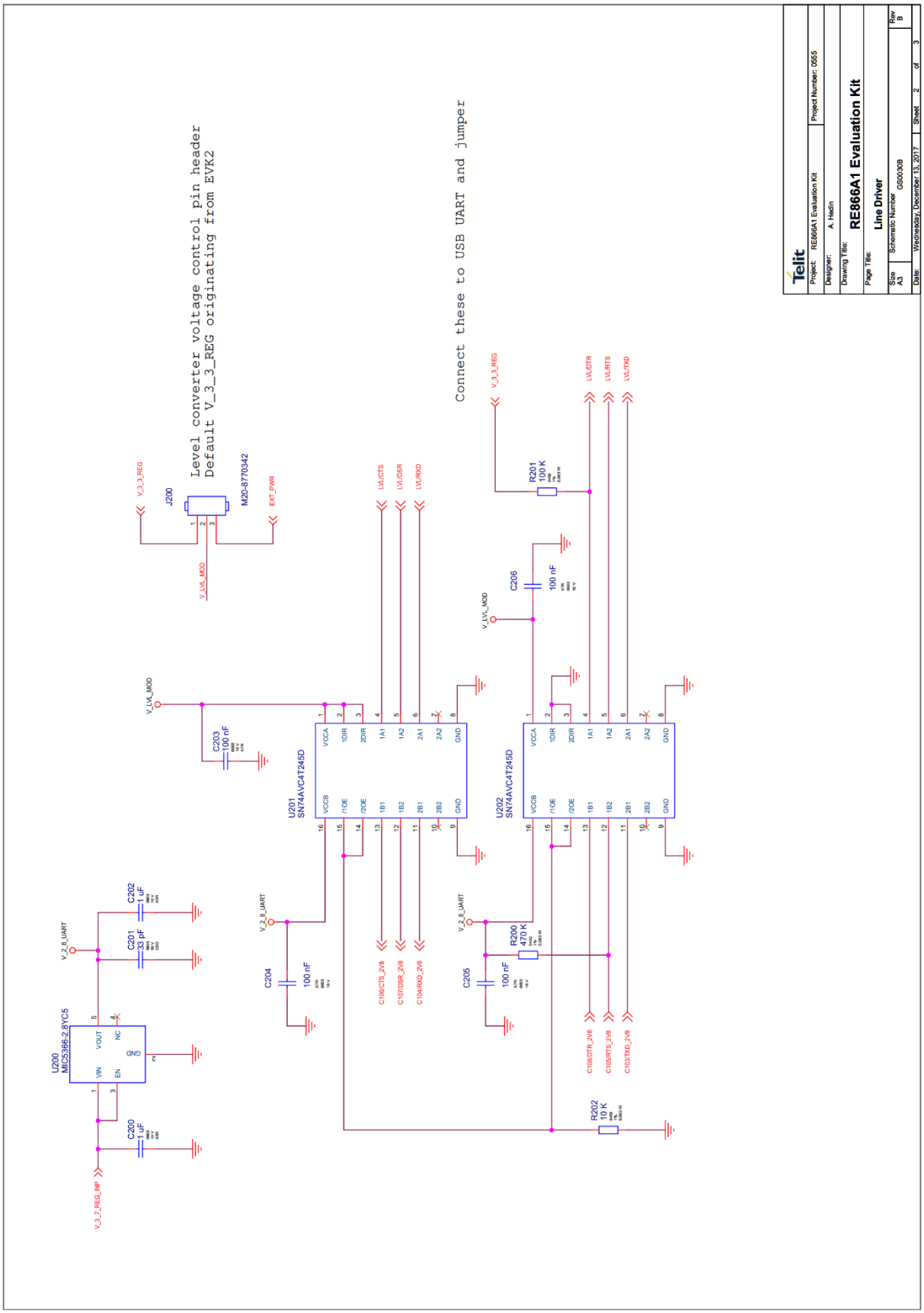
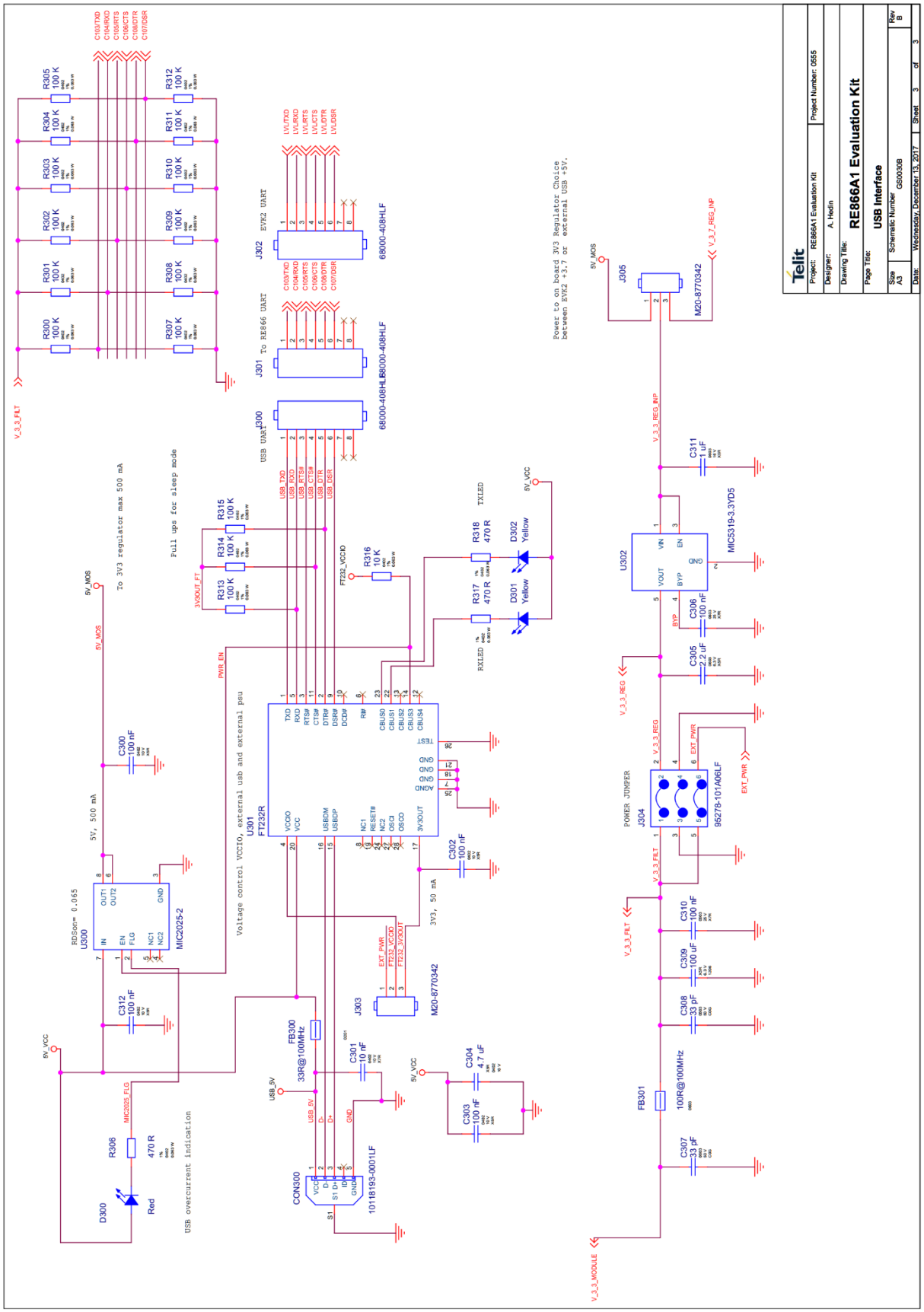


Figure 3: RE866 Evaluation Kit board default configuration

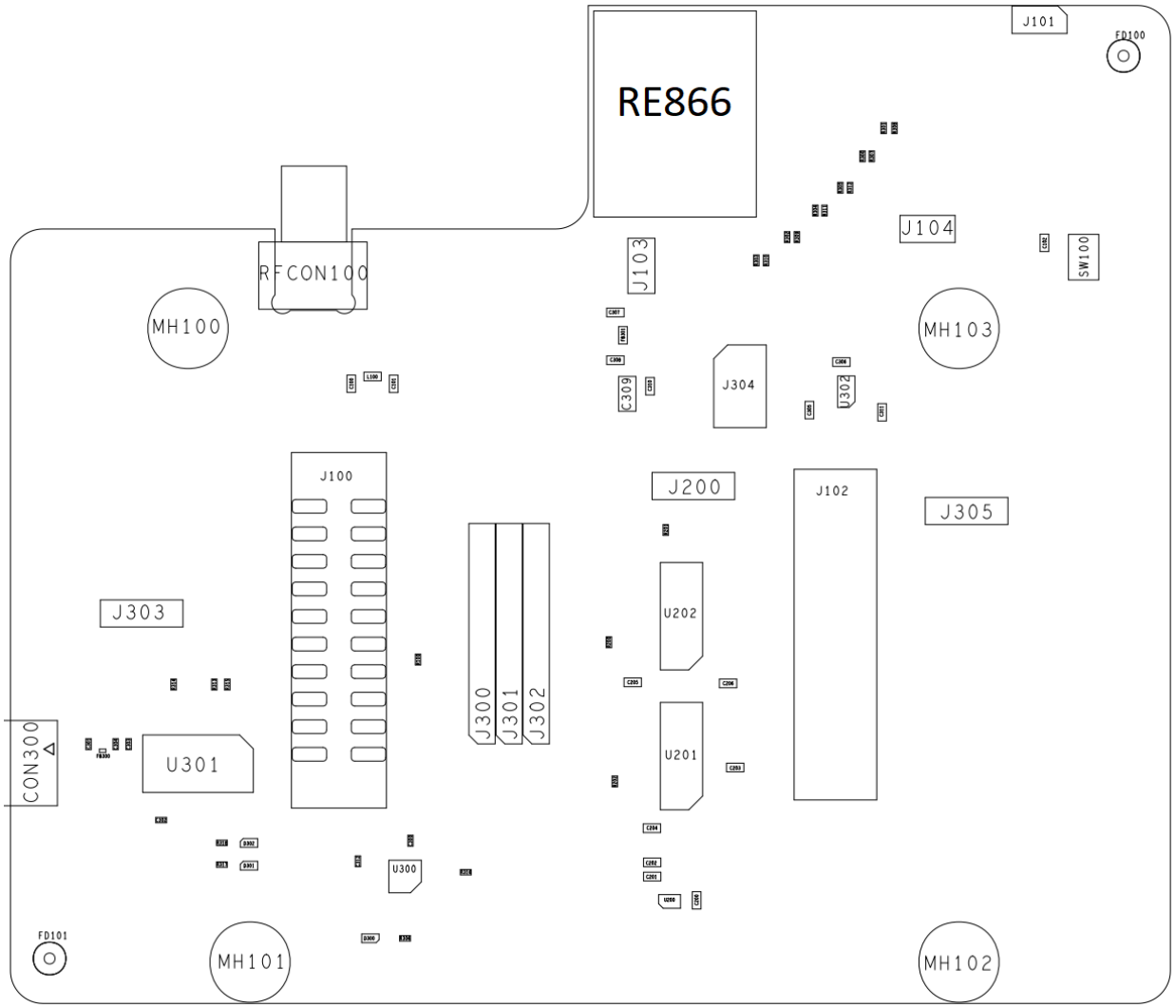
4. SCHEMATICS




Level converter voltage control pin header
Default V_3_3_REG originating from EVK2
Connect these to USB UART and jumper
Telit
Project: RE866A1 Evaluation Kit
Project Number: 0555
Designer: A. Hedin
Drawing Title: RE866A1 Evaluation Kit
Page Title: Line Driver
Size A3
Schematic Number GS00308
Rev B
Date: Wednesday, December 13, 2017
Sheet 2 of 3
J200
M20-8770342
V_3_3_REG
EXT_PWR
V_LVL_MOD
LVL/CTS
LVL/DSR
LVL/RXD
LVL/DTR
LVL/RTS
LVL/TXD
U200
MIC5366-2.8YC5
U201
SN74AVC4T245D
U202
SN74AVC4T245D
V_2_8_UART
V_3_3_REG_INP
C200 1 uF
C201 33 pF
C202 1 uF
C203 100 nF
C204 100 nF
C205 100 nF
C206 100 nF
R200 470 K
R201 100 K
R202 10 K
C106/CTS_2V8
C107/DSR_2V8
C104/RXD_2V8
C108/DTR_2V8
C105/RTS_2V8
C103/TXD_2V8


RE866A1 Evaluation Kit
USB Interface
Project: RE866A1 Evaluation Kit
Project Number: 0555
Designer: A. Hedin
Drawing Title: RE866A1 Evaluation Kit
Page Title: USB Interface
Size A3
Schematic Number GS03308
Rev B
Date: Wednesday, December 13, 2017
Sheet 3 of 3
Power to on board 3V3 Regulator Choice between EVK2 +3.7 or external USB +5V.
To RE866 UART
EVK2 UART
USB UART
Full ups for sleep mode
To 3V3 regulator max 500 mA
Voltage control VCCIO, external usb and external psu
USB overcurrent indication
5V, 500 mA
3V3, 50 mA
MIC2025-2
FT232R
MIC5319-3.3YD5
M20-8770342
95278-101A06LF
10118193-0001LF
68000-408HLF

5. PLACEMENT


RE866
J101
FD100
RFCON100
J103
J104
SW100
MH100
MH103
J304
C309
U302
J100
J200
J102
J305
J303
U202
J300
J301
J302
CON300
U301
U201
U300
FD101
MH101
MH102

6. SETUP

6.1. System Requirements

- PC with Windows® XP or higher
- 1 free USB port
- Adobe Acrobat® Reader for reading the documentation

6.2. Startup

To install the RE866 Evaluation Kit connect it as follows.

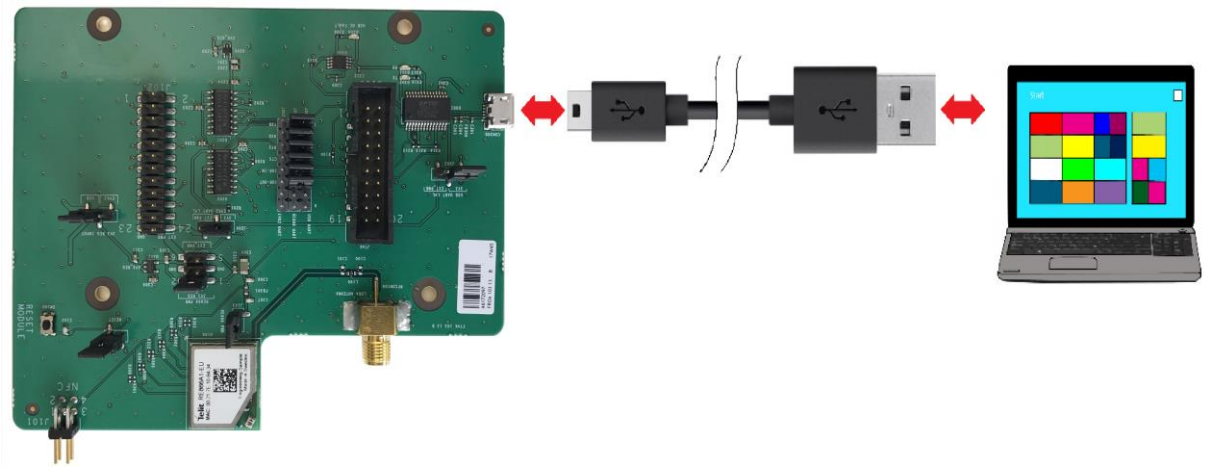


Figure 4: Connect the RE866 Evaluation Kit board to your PC

6.3. Installation of the USB Driver

If required download the latest FTDI VCP USB to UART driver from:

http://www.ftdichip.com/Drivers/VCP.htm

Connect the RE866 Evaluation Kit board to a free USB port of a PC and install the USB device drivers by following the instructions of the Windows® Hardware Wizard using the downloaded FTDI VCP USB to UART driver.

The USB connection is used for power supply and for UART communication to a PC over a virtual COM port. This lets you use a terminal emulation program to perform the configuration or to control the RE866 Evaluation Kit.

You may use the Telit AT Controller (version 3.4.11 or higher) to communicate with the RE866 Evaluation Kit. The Telit AT Controller is available in the download zone.

7. USAGE OF THE RE866 EVALUATION KIT

7.1. Configuration of the RE866 Evaluation Kit

If the RE866 Evaluation Kit is correctly connected to the PC, the Telit AT Controller (or any other terminal emulation program) can be used to read and modify the configuration settings.

Figure 5: Telit AT Controller main menu

As shipped by the factory, the RE866 Evaluation Kit works at 115,200 bps, using the 8N1 data format (8 data bits, no parity, 1 stop bit) and hardware flow control active. Please configure the Telit AT Controller accordingly. Select the COM port the RE866 Evaluation Kit is connected to (COM7 in the example below).

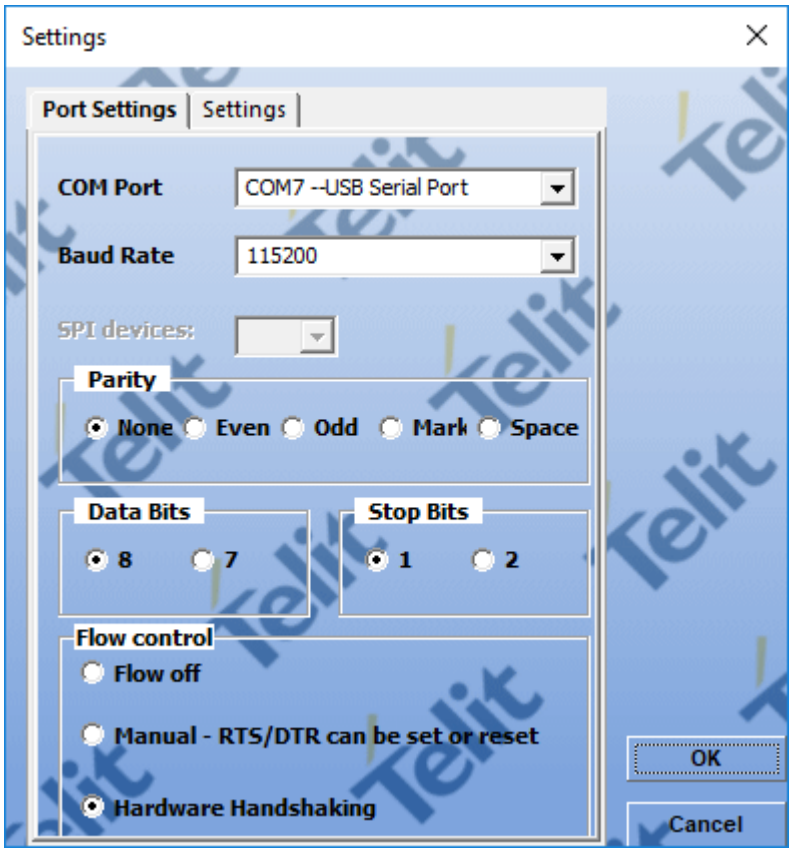


Figure 6: Telit AT Controller settings

Once you have successfully configured the Telit AT Controller press the “Connect” button to connect to the RE866 Evaluation Kit and receive the device information.

Figure 7: Telit AT Controller device information

Now you can start the AT Terminal to communicate with the RE866 Evaluation Kit using AT commands (e.g. set the local device name with at+bname=test123).

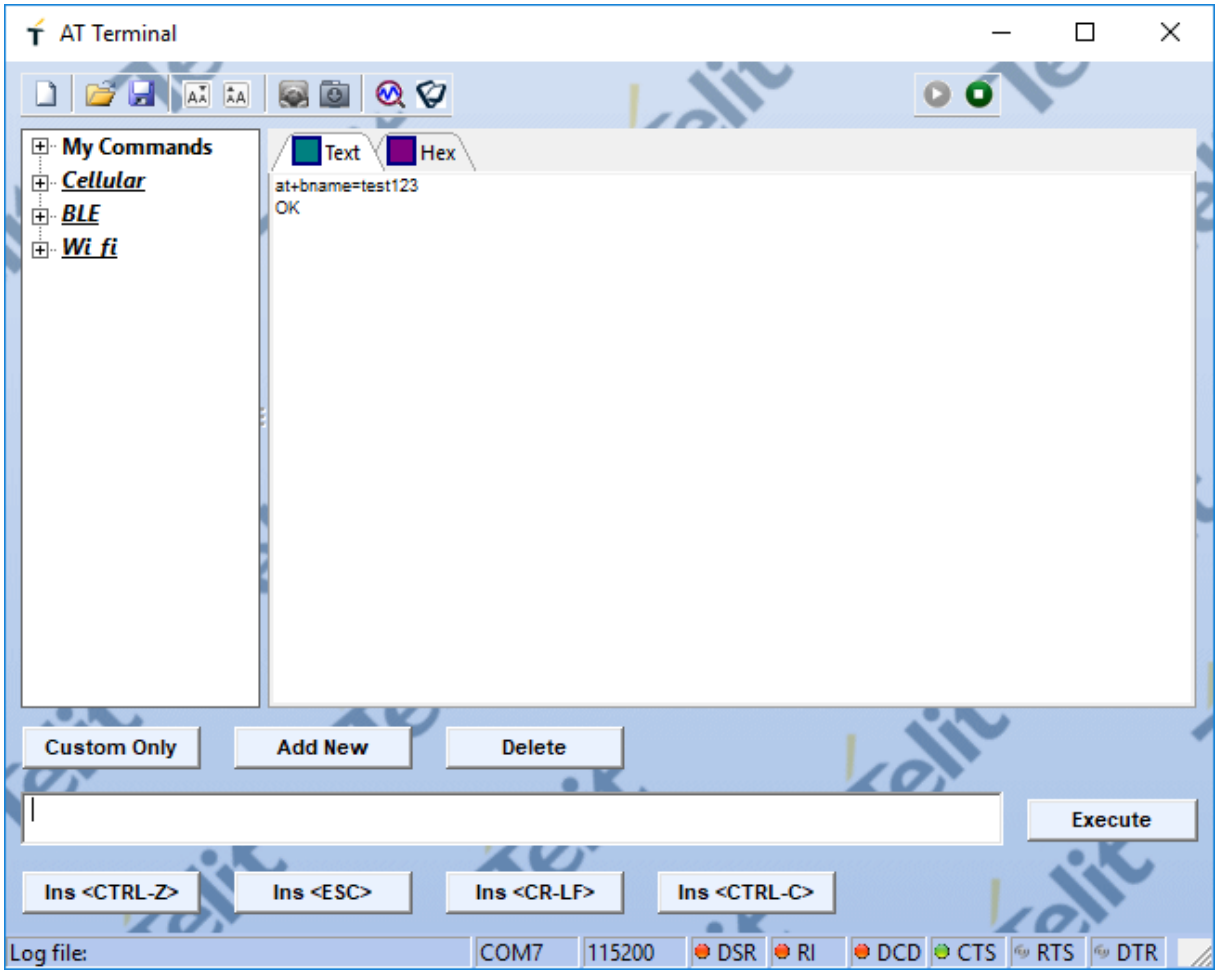


Figure 8: AT Terminal communication

For a more detailed description of the AT commands used for this purpose, please consult our RE866 AT Command Reference [2].

7.2. LoRa Connection using Multitech Gateway

First you need to configure the network server. In the example below a MultiTech Conduit gateway is used. For the purposes of this guide, we assume that you have completed the initial hardware setup of the MultiTech Conduit gateway, the required LoRa mCard and the Ethernet connection as explained by MultiTech in their supporting materials.

When this is complete, you must configure the MultiTech gateway network server as follows:

- Log in to the LoRa Network Server Configuration panel **(Setup > LoRa network server)**
- Configure the server by doing the following:
  - Tick Public
  - Set the Network EUI to e.g. **0123456789abcdef**
  - Set the Network Key dropdown to **Key**
  - Set the Key text field to e.g. **0123456789abcdef0123456789abcdef**

Now that you have configured the network server you have to set the same parameter in the module as configured in the gateway.

Network ID is the AppEUI that you can set with the following AT command:

```
[TX] AT+LAPPEUI=0123456789abcdef<CR>
[RX] AT+LAPPEUI=0123456789abcdef<CR>
     <CR><LF>
```

The network key is the AppKey that you can set with the following AT command:

```
[TX] AT+LAPPKEY=0123456789abcdef0123456789abcdef<CR>
[RX] AT+LAPPKEY=0123456789abcdef0123456789abcdef<CR>
     <CR><LF>
```

After that we need to set the activation as OTAA with the following command:

```
[TX] AT+LJOINM=1<CR>
[RX] AT+LJOINM=1<CR>
     <CR><LF>
```

Now the module is ready to join the network. But before it, disable the BT advertising with the AT command:

```
[TX] AT+LEADE=3<CR>
[RX] AT+LEADE=3<CR>
     <CR><LF>
```

Now let’s join the network.

```
[TX] AT+LJOINNET<CR>
[RX] AT+LJOINNET<CR>
     <CR><LF>
     OK<CR><LF>
     DL,JOIN_SUCCESS<CR><LF>
```

As shown if success you will get JOIN SUCCESS message otherwise JOIN FAIL or timeout.

Now you can send data with:

```
[TX] AT+LSENDDATA=1234,1<CR>
[RX] AT+LSENDDATA=1234,1<CR>
     <CR><LF>
     OK<CR><LF>
     DL,ACK<CR><LF>
```

In case the gateway will send data to the node you can have also:

```
[TX] AT+LSENDDATA=1234,1<CR>
[RX] AT+LSENDDATA=1234,1<CR>
     <CR><LF>
     OK<CR><LF>
     DL,ACK,DATA<CR><LF>
```

Where you can see also the DATA indication that mean that the server send data to the module and you can read with the following command.

```
[TX] AT+LGETDATA<CR>
[RX] AT+LGETDATA<CR>
     <CR><LF>
     +LGETDATA:1234,-64,27,1<CR><LF>
     <CR><LF>
```

In this case the data sent by the server was 1234.

7.3. Bluetooth Connection with Telit “Terminal IO Utility” App

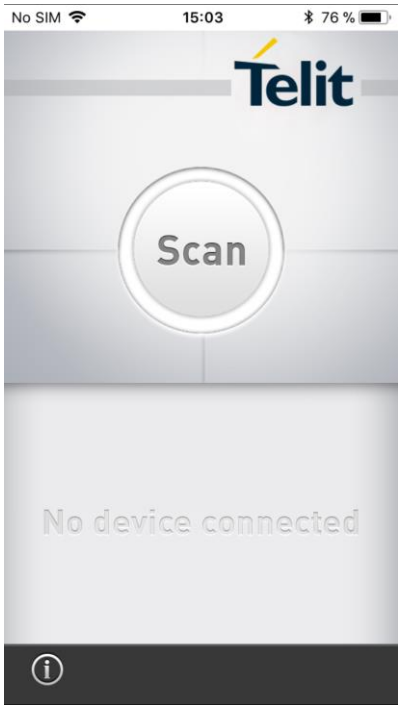
Telit provides the "Terminal IO Utility" App for iOS and Android which can be used to establish a Bluetooth Low Energy connection from a smartphone to the RE866 Evaluation Kit.

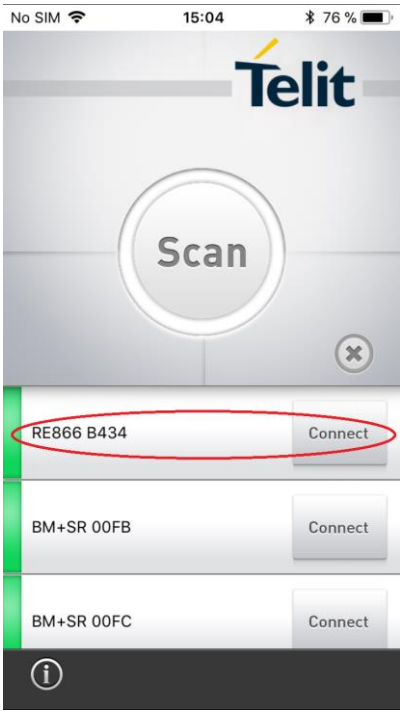
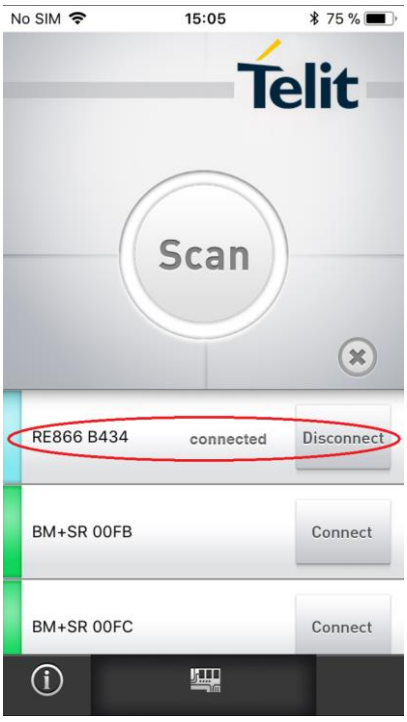
The following QR-Codes provide the link to download the "Terminal IO Utility".

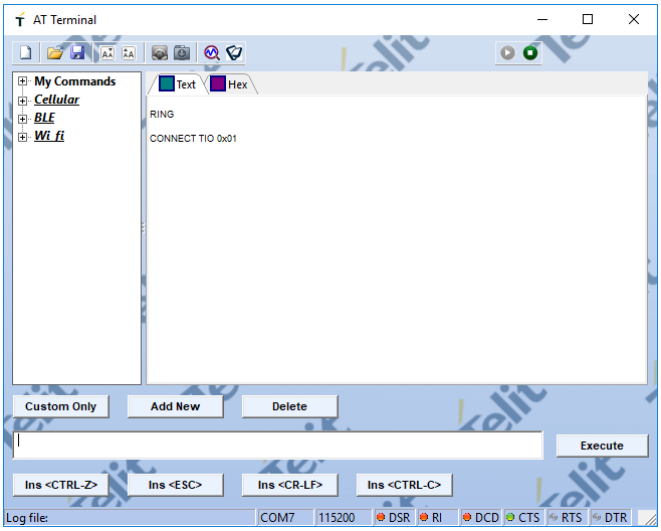
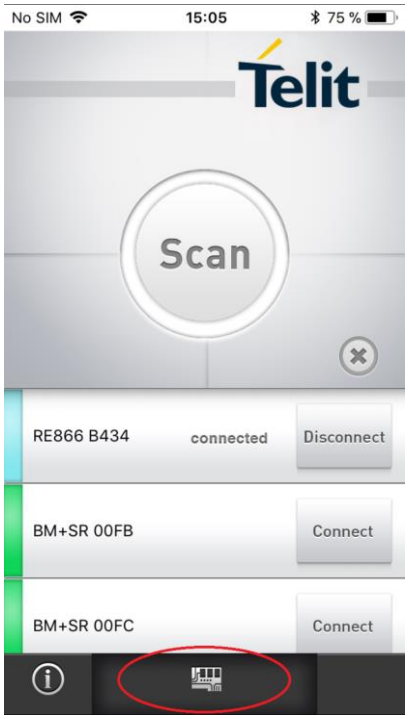
iOS	Logo	Android

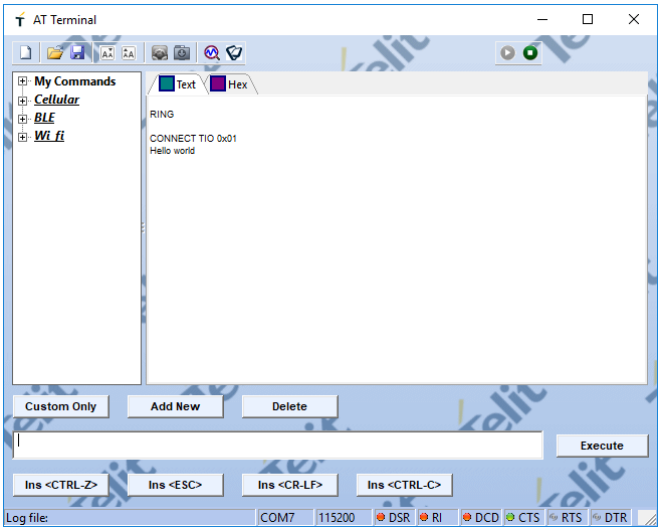
The “Terminal IO Utility” App allows the user to connect to Terminal I/O peripheral devices and exchange data providing a simple terminal emulation.

Please find below an example using the “Terminal IO Utility” App for iOS:

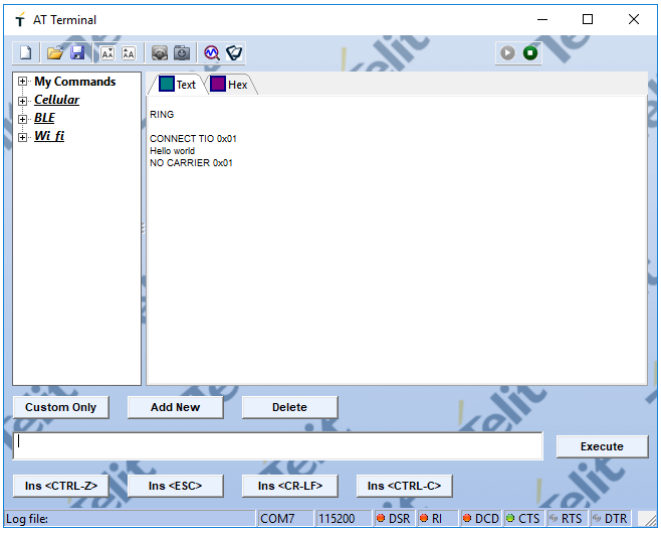
Press the “Scan” button to search for available Terminal I/O peripheral devices.	

Check if your RE866 Evaluation Kit (RE866 xxxx) is found and press the “Connect” button to establish the connection to the RE866 Evaluation Kit.	
The first connection attempt will last some seconds. If the connection attempt succeeded the device status is changed to “connected”.	

The RE866 Evaluation Kit is sending a RING message followed by a CONNECT TIO 0x01 message at the serial port.	
For transmitting data to the RE866 Evaluation Kit click on the icon at the bottom of the page.	

Enter data in the corresponding field and press the “Send” button.	
The RE866 Evaluation Kit is receiving the sent data. To send data from the RE866 Evaluation Kit to the iPhone just enter the data in the terminal emulation program (data are not echoed in the example).	

The “Terminal IO Utility” app on the iPhone is receiving the data.	
To terminate the connection press the “Disconnect” button.	

After the connection is terminated the RE866 Evaluation Kit is sending a NO CARRIER 0x01 message.	

8. FIRMWARE UPDATE

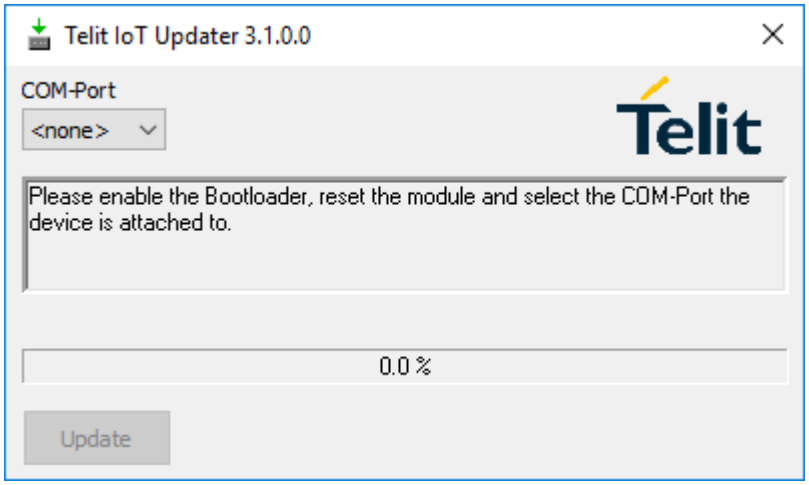
The firmware of the RE866 Evaluation Kit can be updated via the local UART interface by using the Telit IoT Updater tool or over the air.

8.1. Telit IoT Updater

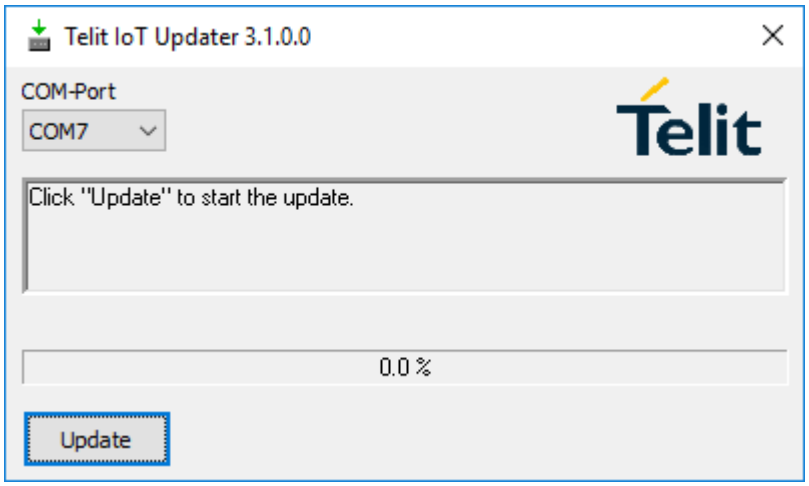
The Telit IoT Updater is a Windows™ program that contains the firmware and uses a PC with a serial port for the update. The file name of the executable program consists of version and patch information.

Please follow the instructions below for updating the firmware:

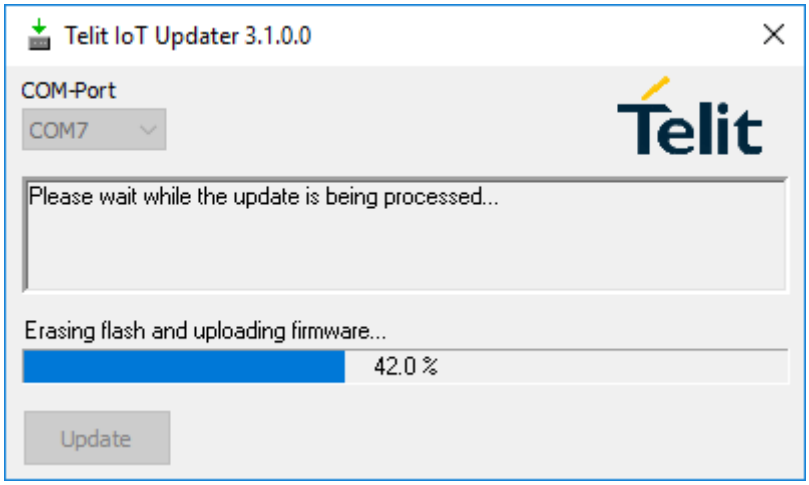
- Set BOOT0 pin to high level (V_{cc}) to activate the bootloader at start-up (connect jumper J102 pin 5 to jumper J304 pin 5)
- Connect the RE866 Evaluation Kit to the USB port of a PC (make sure the FTDI VCP USB to UART driver is already installed).
- Start the RE866_xxx_FWupdate.exe program.



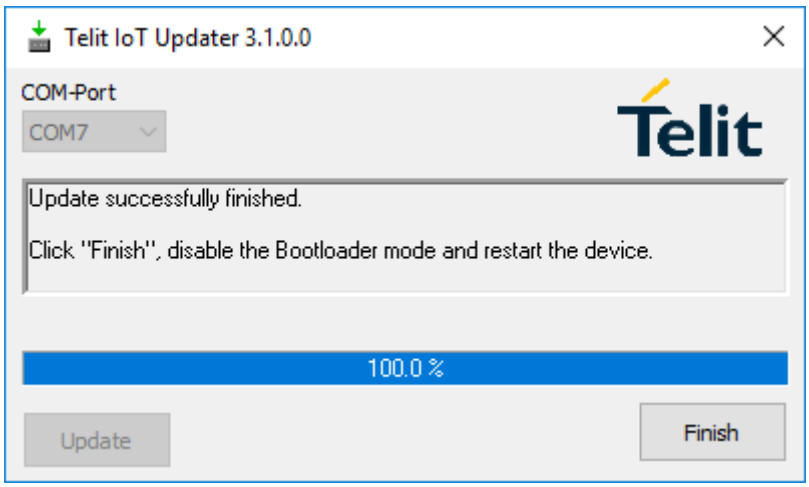
- Select the COM port the RE866 Evaluation Kit is connected to and press the “Update” button.



- The firmware will be uploaded.



- After the update is completed click the “Finish” button.



Do not disconnect the device while the update is in progress, otherwise the update will fail and has to be repeated. In case it is not possible to update the module please contact the Telit support (mailto:ts-srd@telit.com).

8.2. Firmware Update Over The Air (OTA)

The RE866 Evaluation Kit supports firmware update over the air. The firmware update over the air can be performed by using the Nordic nRF ToolBox app available for iOS and Android or by using the Nordic Master Control Panel and the corresponding Nordic Bluetooth hardware.

The firmware over the air update will be enabled with the commands below:

- AT+DFUMODE=2
- AT+DFUSTART

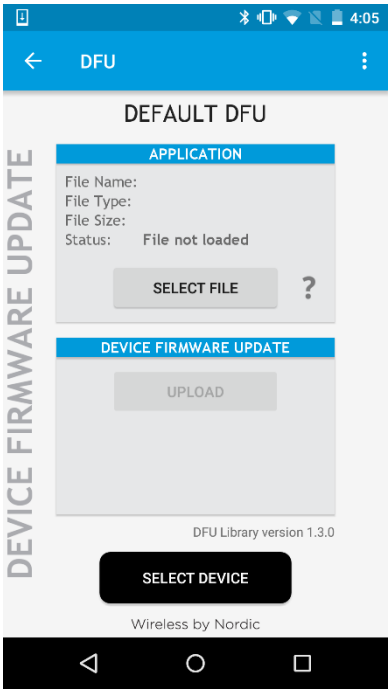
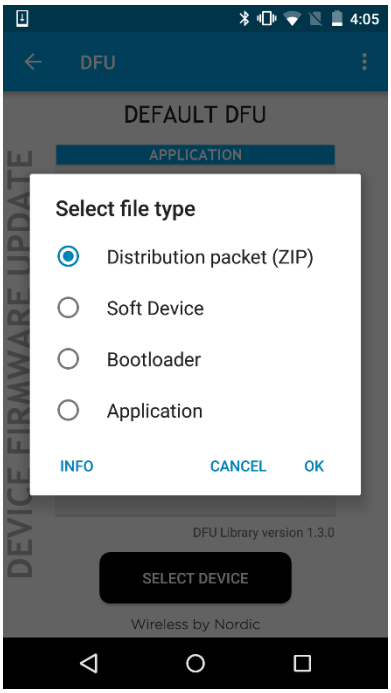
After sending the AT+DFUSTART command the RE866 Evaluation Kit is visible in the air as “RE866DFU” (name configured with command AT+DFUNAME) for a time period of 2 minutes. If no firmware update is performed during this time the RE866 Evaluation Kit will continue with normal operation.

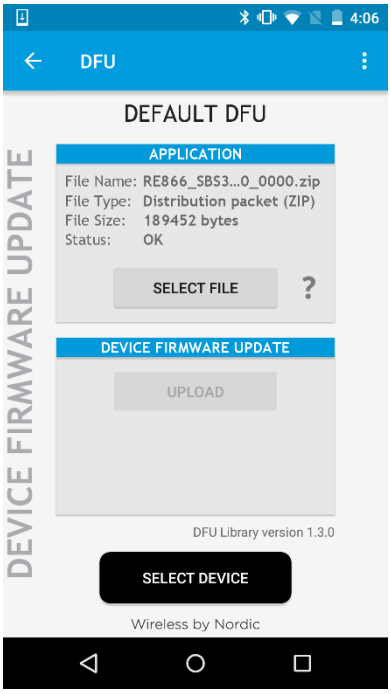
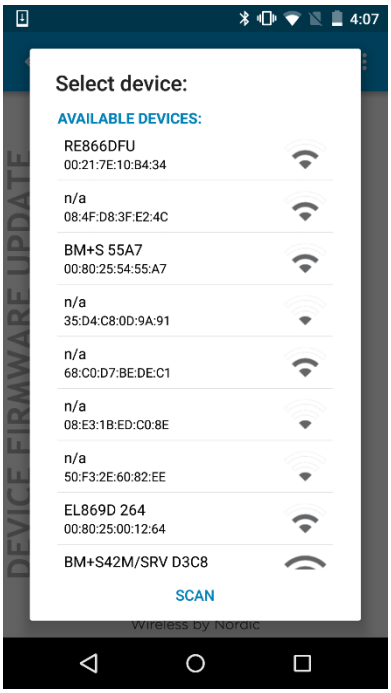
The following chapter describes the firmware over the air update by using the Nordic nRF Toolbox app on Android.

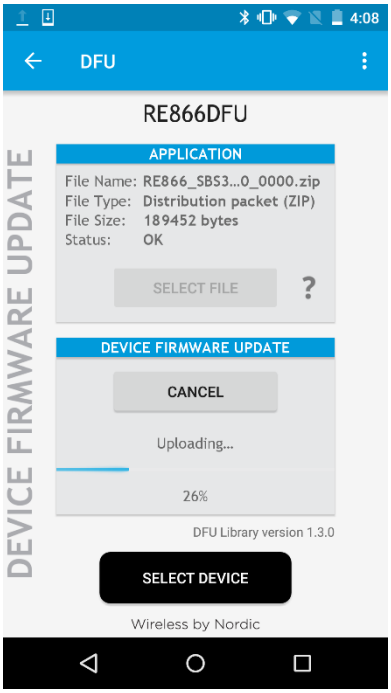
8.2.1. OTA Firmware Update using Nordic nRF Toolbox on Android

Make sure the RE866 Evaluation Kit has already activated the firmware over the air update.

Open the nRF ToolBox app on the smartphone and choose “DFU“.	

Press the button “SELECT FILE”.	
Select file type “Distribution packet (ZIP)”.	

Search via file manager for the firmware package which was previously copied to the smartphone (e.g. RE866_SBSxxxx_xx_x_xxxx.zip in the example).	
Press the button “SELECT DEVICE” and select the “RE866DFU” from the list of available devices.	

Press the “UPLOAD” button to upload the firmware package over the air to the RE866 Evaluation Kit.	

After the file was uploaded successfully the RE866 Evaluation Kit will start with the new firmware.

9. DOCUMENT HISTORY

Revision	Date	Changes
r0	2017-12-06	First issue
r1	2018-01-12	Replaced TeraTerm by Telit AT Controller Replaced BlueMod+S Updater by IoT Updater
r2	2018-06-06	Added chapter 3.6.3 “Connector J102” Added chapter 4 “Schematics” Added chapter 5 “Placement” Added an additionally placement picture with the default jumper settings in chapter 3.7

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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