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1. Introduction

1.1. Scope

This document describes the usage of the development kit (based on hardware version 3.0) for the Bluetooth module BlueMod+S/ANT.

1.2. Audience

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

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-SRD@telit.com

Alternatively, use:

<http://www.telit.com/support>

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

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

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] BlueMod+S Hardware User Guide, 1VV0301275
- [2] BlueMod+S Test Mode Reference
- [3] BlueEva+S Schematic



3. Hardware

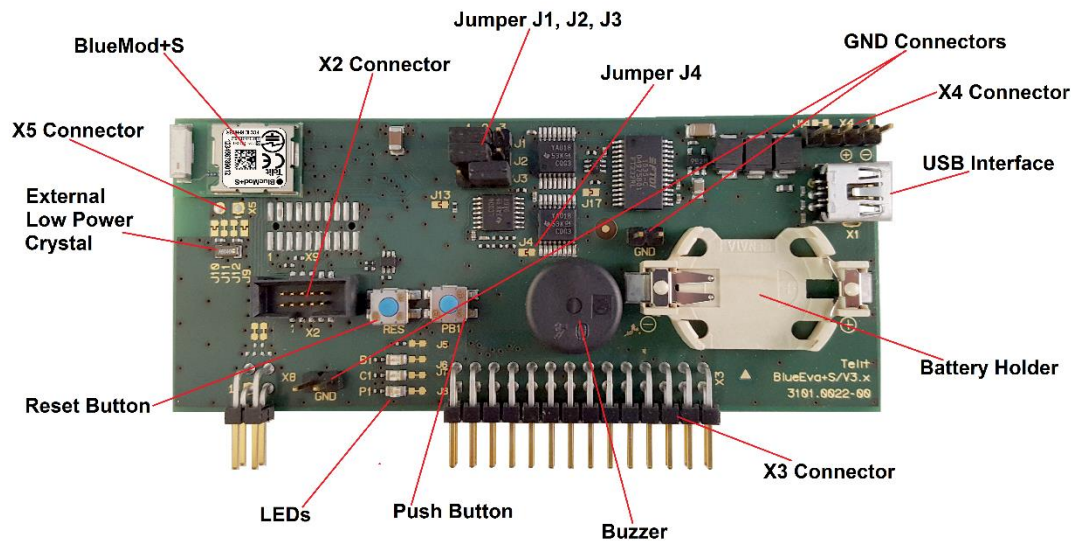


Figure 2: BlueDev+S/ANT

3.1. BlueMod+S

The BlueDev+S/ANT is equipped with a BlueMod+S Bluetooth module.

3.2. Reset

The BlueDev+S/ANT is equipped with a reset button. Pressing the reset button will trigger the BlueMod+S module to perform a reset. The USB port is not influenced by the reset.

3.3. USB Interface

The BlueDev+S/ANT provides an USB interface which is used to connect the evaluation board to the host and as power supply. The presence of the supply voltage is indicated by LED P1.

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

The serial port is a high-speed UART interface at CMOS levels and supports the following features:

- Transmission speed: 9,600 – 921,600 bps (asynchronous)
- Character representation: 8 bit, no parity, 1 stop bit (8N1)
- Hardware flow-control with RTS/CTS (active low)

For details please refer to the *BlueMod+S Hardware User Guide* [1].



3.4. LEDs

The BlueDev+S/ANT provides several LEDs for functional indication.

Interface	Position	Function
LEDs	B1	Connected to GPIO[3] ⁽¹⁾
	C1	Connected to GPIO[2] ⁽¹⁾
	P1	Indicates the presence of power supply voltage

(1) Function depending on firmware support.

3.5. External Low Power Crystal

The BlueDev+S/ANT provides an external low power crystal. This is connected to the BlueMod+S by default. For using alternate low power crystal sources refer to the *schematics [3]* and the *BlueMod+S Hardware User Guide [1]*.

3.6. Connectors / Jumpers

3.6.1. Jumper J1 and Jumper J2

Jumper J1 is used in conjunction with the provided demo application to enter manual test mode. J1 has to be set to position 2-3 and jumper J2 has to be set to position 1-2 to enter manual test mode.

Jumper J2 is used in conjunction with the provided demo application to enter the direct test mode (DTM). J1 and J2 have to be set to position 2-3 to enter DTM.

J1 Position	J2 Position	Function
1-2	1-2	Normal application start
2-3	1-2	Start manual test mode
2-3	2-3	Start Direct Test Mode (DTM)
1-2	2-3	Not used in demo application.

3.6.2. Jumper J3

Jumper J3 is used to switch the PC DTR# pin to two different module pins.

Jumper Number	Position	Function
J3	1-2	DTR# connected to IUR-IN#
J3	2-3	DTR# connected to GPIO[4]



3.6.3. Jumper J4

Jumper J4 provides the possibility to disable (by closing it with a soldering point) the USB to serial bridge. With a closed jumper J4, the modules serial port is routed to Connector X3 see chapter 3.6.5.

3.6.4. Connector X2

Connector X2 is used as “Debug in” to connect a debugger to the BlueMod+S module.

3.6.5. Connector X3

Connector X3 is a 28 pin extension header exposing all module signals.

Pin Number	Signal	Type	Description
1	+3V0	PWR	Supply voltage output
2	+3V0	PWR	Supply voltage output
3	GND	PWR	Ground
4	GND	PWR	Ground
5	GPIO[0]	I/O	GPIO ⁽¹⁾
6	GPIO[1]	I/O	GPIO ⁽¹⁾
7	GPIO[2]	I/O	LED C1, user IO
8	GPIO[3]	I/O	LED B1, user IO
9	GPIO[4]	I/O	GPIO ⁽¹⁾
10	GPIO[5]	I/O	GPIO ⁽¹⁾
11	GPIO[6]	I/O	GPIO ⁽¹⁾
12	GPIO[7]	I/O	GPIO ⁽¹⁾
13	GPIO[8]	I/O	GPIO ⁽¹⁾
14	GPIO[9]	I/O	GPIO ⁽¹⁾
15	GPIO[10]	I/O	GPIO ⁽¹⁾
16	GPIO[11]	I/O	GPIO ⁽¹⁾
17	GPIO[12]	I/O	GPIO ⁽¹⁾
18	GPIO[13]	I/O	GPIO ⁽¹⁾



19	GPIO[14]	I/O	GPIO ⁽¹⁾
20	PO26_AIN0		See schematic ⁽¹⁾
21	PO27_AIN1		See schematic ⁽¹⁾
22	EXT-RES#	I-PU	User reset
23	UART-TXD ⁽²⁾	O-PP	IUR data OUT
24	UART-RXD ⁽²⁾	I	IUR data IN
25	UART-CTS# ⁽²⁾	I	Flow control
26	UART-RTS# ⁽²⁾	O-PP	Flow control
27	IUR-IN# ⁽²⁾	I/O	GPIO ⁽¹⁾
28	IUR-OUT# ⁽²⁾	I/O	GPIO ⁽¹⁾

PU = PullUp, PD = PullDown, PP = PushPull, I-DIS = InputBufferDisconnected

(1) Function depending on firmware support

(1) Disconnected from module when jumper J4 is open

3.6.6. Connector X4

Connector X4 provides the possibility to measure the supply current of the BlueMod+S and to power the evaluation board with an external power supply.

Pin Number	Signal
1	GND
2	ext. PWR
3	+3V0
4	+3V0-BT

3.6.7. Connector X5

Connector X5 could be used to insert an external low frequency clock to the nRF51422. Please open the cut off jumper J11 and J12 to disable the onboard crystal before using connector X5.

3.7. Current Measurement

Current measurement of the BlueMod+S can be performed by opening (cut off) jumper J14 and measuring the current between pin 3 and 4 of connector X4.

For measuring the minimum current the FTDI chip must be disconnected from the module. This can be achieved by closing solder jumper J4.



3.11. How To Interface the UART Lines on TTL Level



NOTE:

If you want to access the UART lines directly it is important to disable the onboard USB to serial bridge by closing jumper J4 with a soldering point.

All signals are available at connector X3 and can be connected to your application.

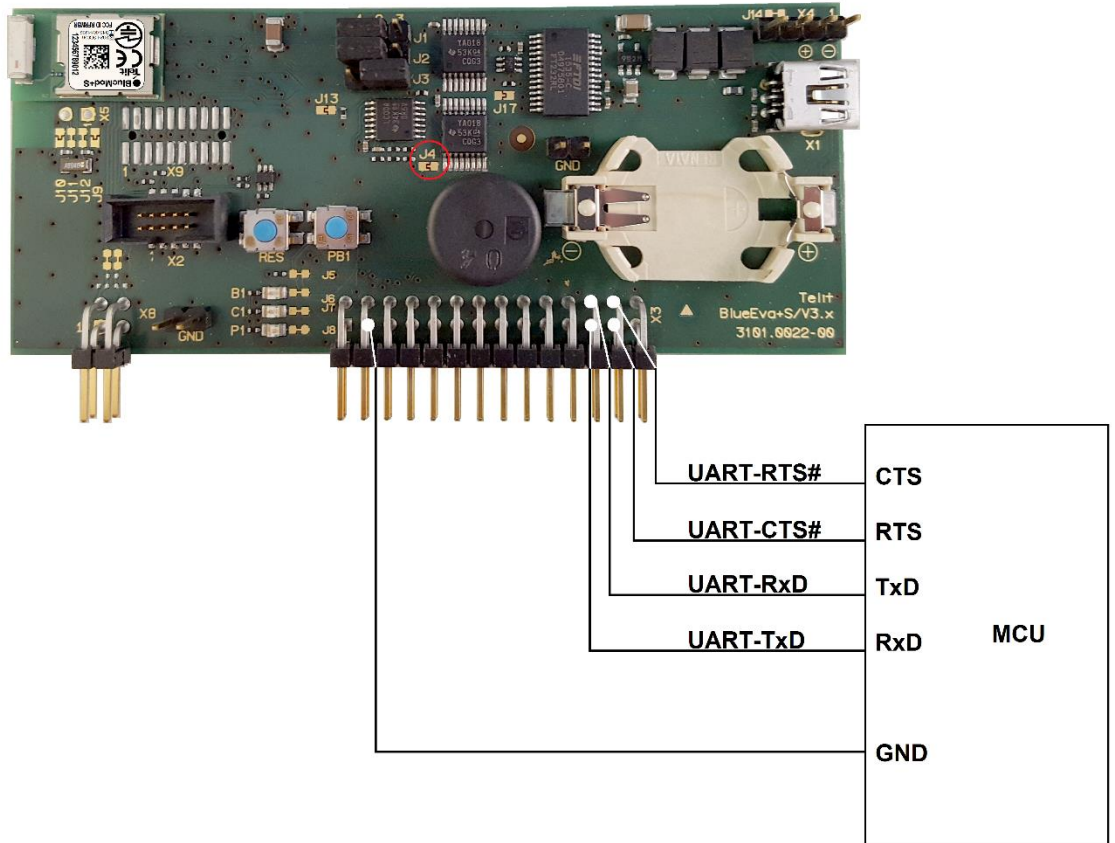


Figure 3: MCU connected to UART lines



3.12. Default Configuration

The BlueDev+S/ANT is preconfigured as described below:

Jumper Number	Position	Function
J1	1-2	Normal operation mode at start-up
J2	1-2	Normal operation mode at start-up
J3	2-3	DTR# connected to GPIO[4]

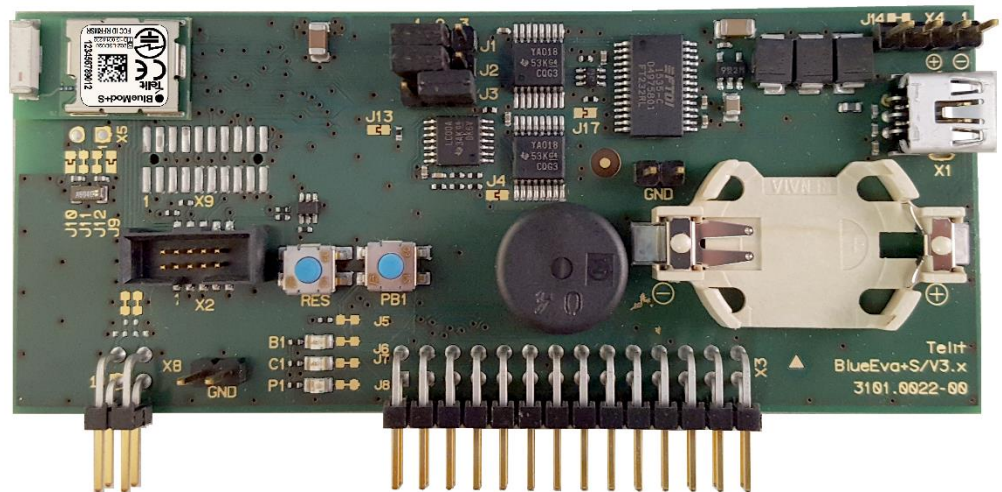


Figure 4: BlueDev+S/ANT default configuration



4. Setup

4.1. System Requirements

- PC with Windows® XP or higher
- 1-2 free USB ports
- Adobe Acrobat® Reader for reading the documentation
- Keil Microcontroller Development Kit for compiling the demo application
- Cortex M0 debugger hardware or Nordics nRF51 DK to be used in debugger mode connected to connector X2

4.2. Startup

To install the BlueDev+S/ANT connect it as follows.

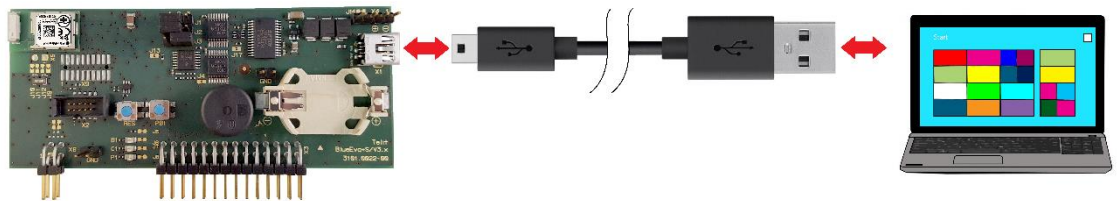


Figure 5: Connect the BlueDev+S/ANT to your PC

4.3. Installation of the BlueDev+S/ANT USB Driver

If required download the latest FTDI VCP USB to UART driver from: <http://www.ftdichip.com/Drivers/VCP.htm>

Connect the BlueDev+S/ANT 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 Bluetooth connection.

You may download the TeraTerm terminal program from the official open source web site: <https://en.osdn.jp/projects/ttssh2/releases/>



4.4. Installing the Debugger

If you don't have a Cortex M0 debugger hardware in use right now, Telit recommends the use of Nordics nRF51 DK.

Please refer to the Nordic website <http://www.nordicsemi.com/eng/Products/Bluetooth-low-energy> for more information on the nRF51 DK.

4.5. Connecting the nRF51 DK to the BlueDev+S/ANT

Use the provided 9-Pin debugger cable to connect the BlueDev+S/ANT connector X2 with the debug out connector on the Nordic PCA10028 board.

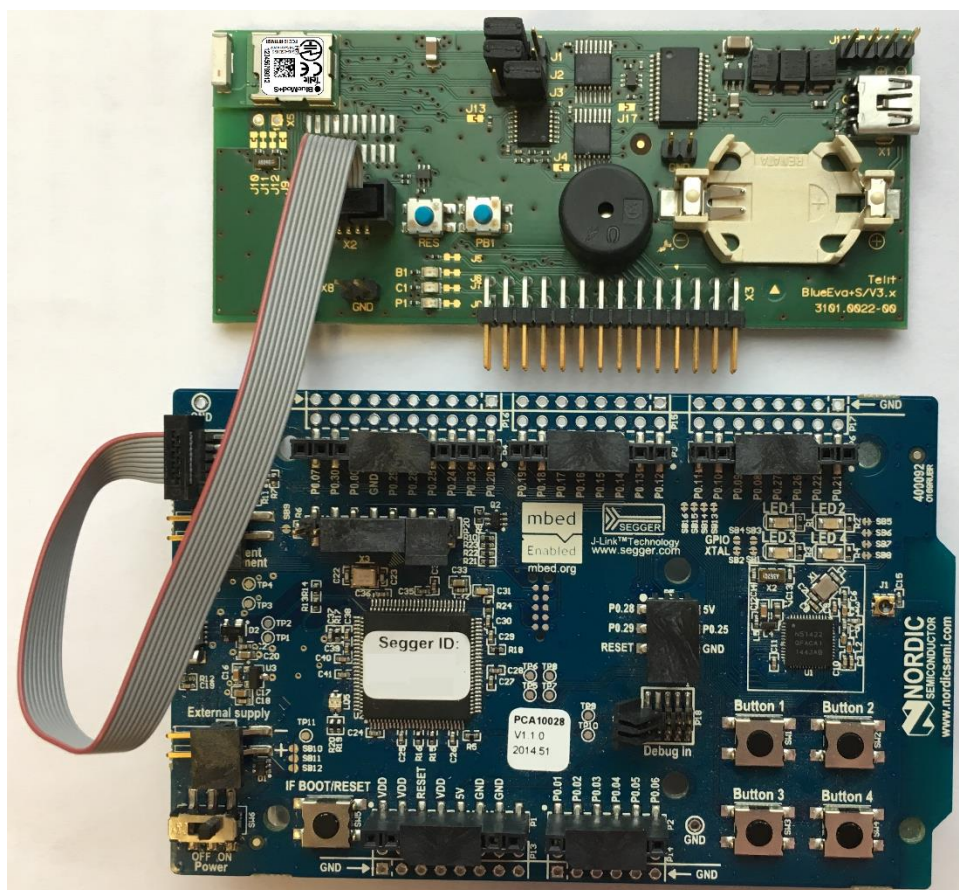


Figure 6: nRF51 DK board PCA10028 connected to BlueDev+S/ANT board



4.6. Downloading and Installing the nRF51 SDK

The Telit demo source code is based on the application template of the nRF51 SDK v9.0.0.

Please download the SDK from <http://developer.nordicsemi.com>.

Please use the repository file nRF51_SDK_9.0.0_XXXXXXX.zip of the SDK.

After installing the nRF51 SDK please compile the peripheral BLE app template project with the Keil compiler to make sure that the installation succeeded. The demo is found in the directory

<nRF51 SDK 9.0.0 PATH>\examples\ble_peripheral\ble_app_template.



5. Usage of the BlueDev+S/ANT

The provided BlueDev+S/ANT development package requires an installed nRF51 SDK v9.0.0. Please copy the directory stoDevKit to the <nRF51 SDK 9.0.0 PATH>\external\ path. The resulting structure should be as follows:

```
<nRF51 SDK 9.0.0 PATH>\external\stoDevKit\...
```

5.1. Telit Demo Source Code

The provided Telit demo source code is based on the

```
<nRF51 SDK 9.0.0 PATH>\examples\ble_peripheral\ble_app_template .
```

The code and project have been modified to support the Telit manual test mode and the Direct Test Mode (DTM) defined by the Bluetooth SIG. It is also possible to assign a public Bluetooth address to be used by the firmware (through a command in manual test mode).



NOTE:

The Telit manual test mode is required if you want Telit to manufacture modules with your own firmware. Please contact Telit for more details on the manufacturing procedure.

5.2. BlueDev+S/ANT Software Package Structure

The directory stoDevKit contains all software provided by Telit. It uses the nRF51 SDK files to build an example project.

5.2.1. The Directory “app_template”

The directory “app_template” contains the modified demo software sources. Please use the ble_app_template.uvmpw file to start the Keil IDE.

The file main.c contains the modifications which are clearly marked by “Stollmann E+V GmbH specific functionality start:”.



5.2.2. The Directory “common”

The directory “common” contains source code files for the Telit manual test mode and the DTM interface software.

Source file	Description
sto_testmode.c	Telit test mode implementation. GPIO control is done in this file. Starts Telit manual test mode, DTM or passes control back to the application code depending on GPIO state (jumpers J1 and J2)
sto_dtmmode.c	DTM interface code. Is called by sto_testmode.c depending on GPIO states
sto_util.c	Contains general utility functions

5.2.3. The Directory “include”

The directory “include” contains board definition headers and required interface files for the source files from the common directory.

Source file	Description
custom_board.h	This file is required by the nRF51 SDK to import custom board specific IO mappings into the SDK
bluemod_s.h	Module specific definitions
bluemod_s_eval.h	Development board specific definitions
sto_testmode.h	Interface prototypes for sto_testmode.c
sto_dtmmode.h	Interface prototypes for sto_dtmmode.c
sto_util.h	Interface prototypes for sto_util.c and additional useful macro definitions

5.3. Using the Demo Application

5.3.1. Demo Application Advertising

After compiling and downloading the app template project to the BlueDev+S/ANT, you can use the jumpers J1/J2 to start the normal advertising mode of the demo application.

- Set jumper J1 to 1-2 and J2 to 1-2
- Reset the module
- Use e.g. a smartphone or Nordic Master Control Panel application to scan for BLE devices
- You will find a device “BM+S_S310_Template” advertising (S310 is the Nordic BLE/ANT protocol stack type running on the nRF51422)



6. Document History

Revision	Date	Changes
r0	2016-10-12	Initial version

