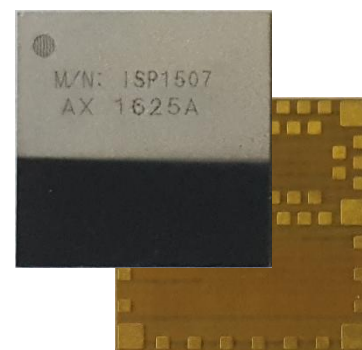


# Application Note AN160601

## Use of ISP1507 Development Kit



### Introduction

#### Scope

This document gives details on hardware and software for using and testing Insight SiP Bluetooth Low Energy module ISP1507 (model ISP1507AX).

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### 1. Recommended Documentation

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The following Nordic Semiconductor documents and Dev Kits (software portion) are required to understand the complete setup and programming methods:

#### Documents:

- ✚ nRF52832 Development kit User Guide (hardware section should be partially ignored – Insight SiP development kit hardware replaces Nordic Semiconductor hardware).
- ✚ nRF52 Series Reference Manual.
- ✚ nRF52832 PS (data sheet).
- ✚ S132 nRF52832 SoftDevice Specification.
- ✚ nRF5 SDK (for software development on the nRF51 and nRF52 Series).

To access documentation, information, go to:

- ✚ <http://www.nordicsemi.com> (Official Nordic Semi website)
- ✚ <http://infocenter.nordicsemi.com/index.jsp> (The Nordic Semiconductor Infocenter is a “comprehensive library” containing technical documentation for current and legacy solutions and technologies)
- ✚ <https://devzone.nordicsemi.com/questions> (Ask any Nordic related question and get help)
- ✚ For any question, you can also open a case on the <http://www.nordicsemi.com>

#### Dev kits (software portion):

- ✚ nRFgo Studio.
- ✚ nRF5 Software Development Kit (SDK):
  - Precompiled HEX files.
  - Source code.
  - Keil ARM project files.
- ✚ S132 nRF52832 SoftDevice.
- ✚ Master Control Panel.

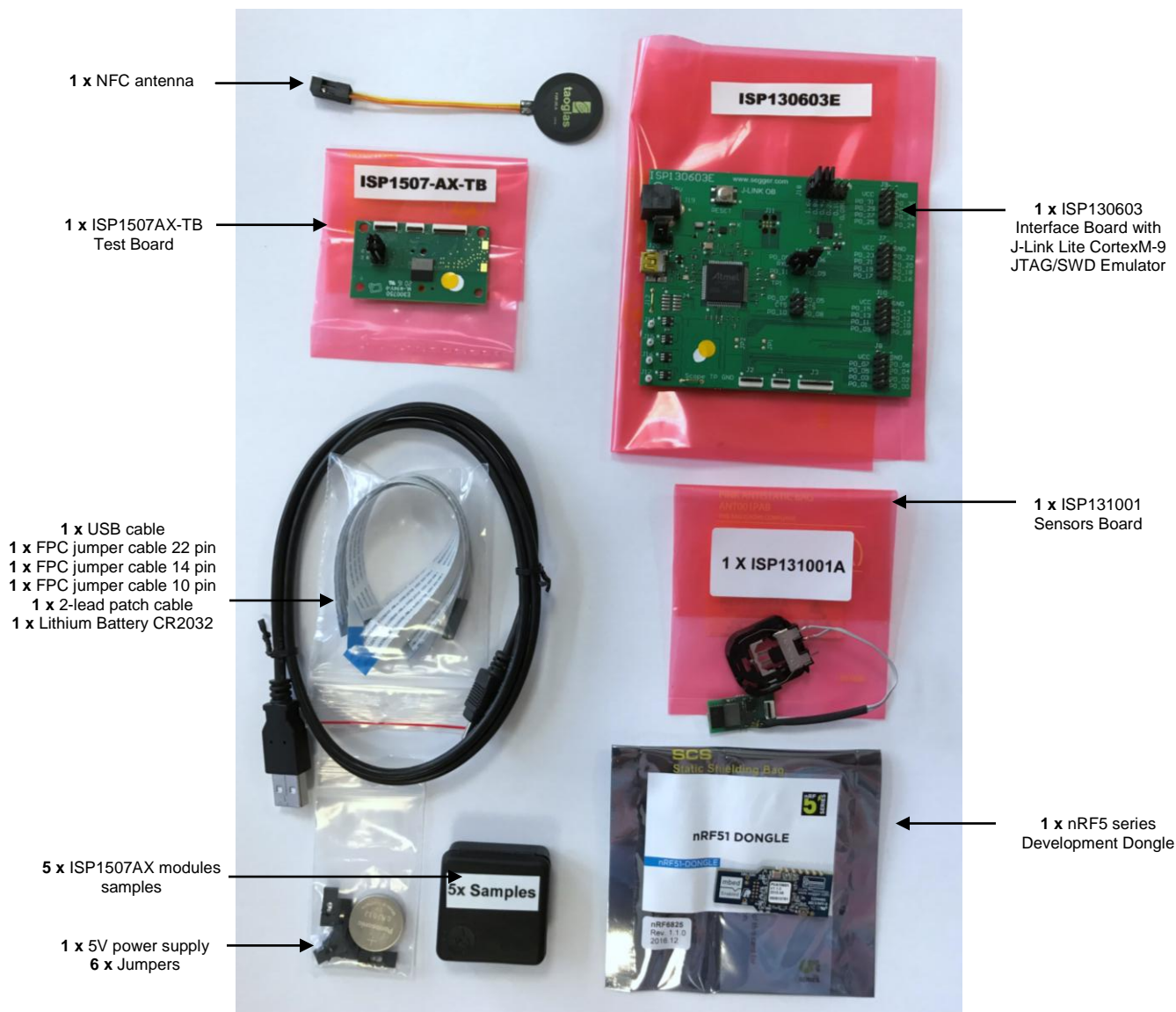
To access these files, go to [www.nordicsemi.com](http://www.nordicsemi.com) and download the files. Instructions can be found in Chapter 3.

#### Other ISP documents that complete the above:

- ✚ AN1606 App Note – this document.
- ✚ DS1507 module data sheet.
- ✚ ISP1507AX-TB Test Board schematic “Schematic\_ISP1507AX-TB”.
- ✚ ISP130603 Interface Board schematic “SC130604”.
- ✚ ISP131001 Sensors Board schematic “SC131002”.



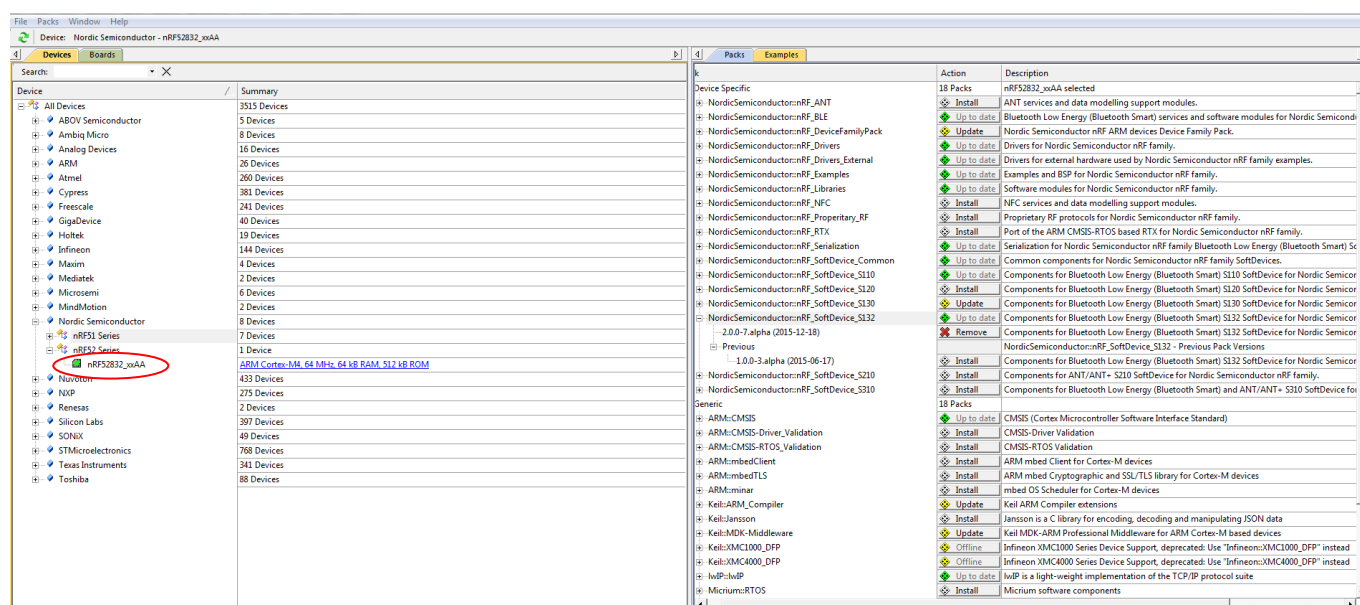
### 2. ISP1507 Dev Kit Hardware Content



### 3. Software Installation

This paragraph describes the steps to follow for software installation.

1. Download and install Keil MDK-ARM from <https://www.keil.com/demo/eval/arm.htm> to your hard drive. After installation, a Pack Installer window appears. Click on the “Packs” section and “Check for updates”. After you can show in the Device section “Nordic Semiconductor” on the left side of the screen and different Packs available on the right side of the screen.



On the “Packs” section, you can download and update Nordic example, nRF SoftDevice, nRF DeviceFamilyPack, nRF examples..., etc ...

All the Packs are installed on the following directory: C:\Keil\_v5\ARM\Pack\NordicSemiconductor.

2. Download and run the J-Link Software and documentation pack for Windows from <http://www.segger.com/jlink-software.html>. The serial number from your SEGGER J-Link hardware is needed to identify your device and can be found printed on the chip on the J-Link Lite emulator board.
3. Go to [www.nordicsemi.com](http://www.nordicsemi.com) and log in to your Nordic My Page account.



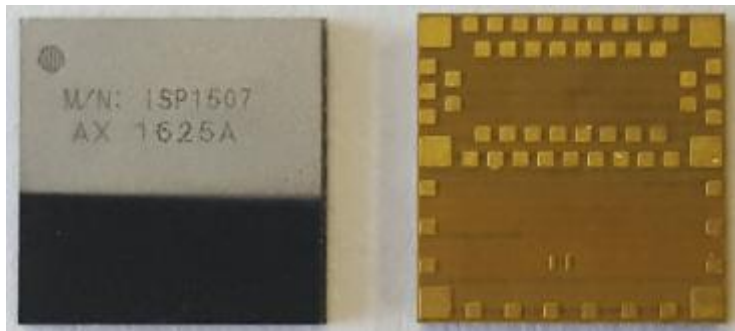
4. Go to Products and click on Bluetooth Smart/Bluetooth Energy. You will have access to the different product :
  - a. nRF52 Series : Click on nRF52832 and on the download section you have access to the documentation, SoftDevice, Master control panel, nRFgo studio, SDK ... etc ...
  - b. nRF52 Development Tools: You can download the last nRF5 SDK.
5. You can also download the SDK in the following link: <https://developer.nordicsemi.com/>.
6. Download, install nRFgo Studio (Make sure to download the last version updated).
7. Download, install Master Control Panel (*x86 is for 32 bits windows and x64 is for 64 bits windows*).



### 4. Hardware Description

#### 4.1. ISP1507AX Module

ISP1507AX is a Bluetooth Low Energy module with integrated antenna.



This module is based on Nordic Semiconductor nRF52832 2.4 GHz wireless SoC. nRF52832 integrates nRF52 series 2.4 GHz transceiver, a 32 bit ARM Cortex™-M4 CPU, flash memory, and analogue and digital peripherals. nRF52832 can support Bluetooth low energy and a range of proprietary 2.4 GHz protocols. The ISP1507AX module measures 8 x 8 x 0.95 mm<sup>3</sup>. The module integrates all the decoupling capacitors, the 32 MHz and 32 kHz crystals, their load capacitors, the DC-DC converter component, the RF matching circuit and the antenna in addition to the wireless SoC. For more details, see Insight SiP module data sheet (document DS1507).

#### 4.2. ISP1507AX-TB Test Board

ISP1507AX-TB is the basic application test board that has dimensions of 30 x 50 mm<sup>2</sup>. When using an ISP130603 Interface Board Rev E, place the jumper on the ISP1507AX TB Test Board as indicated on the picture below:





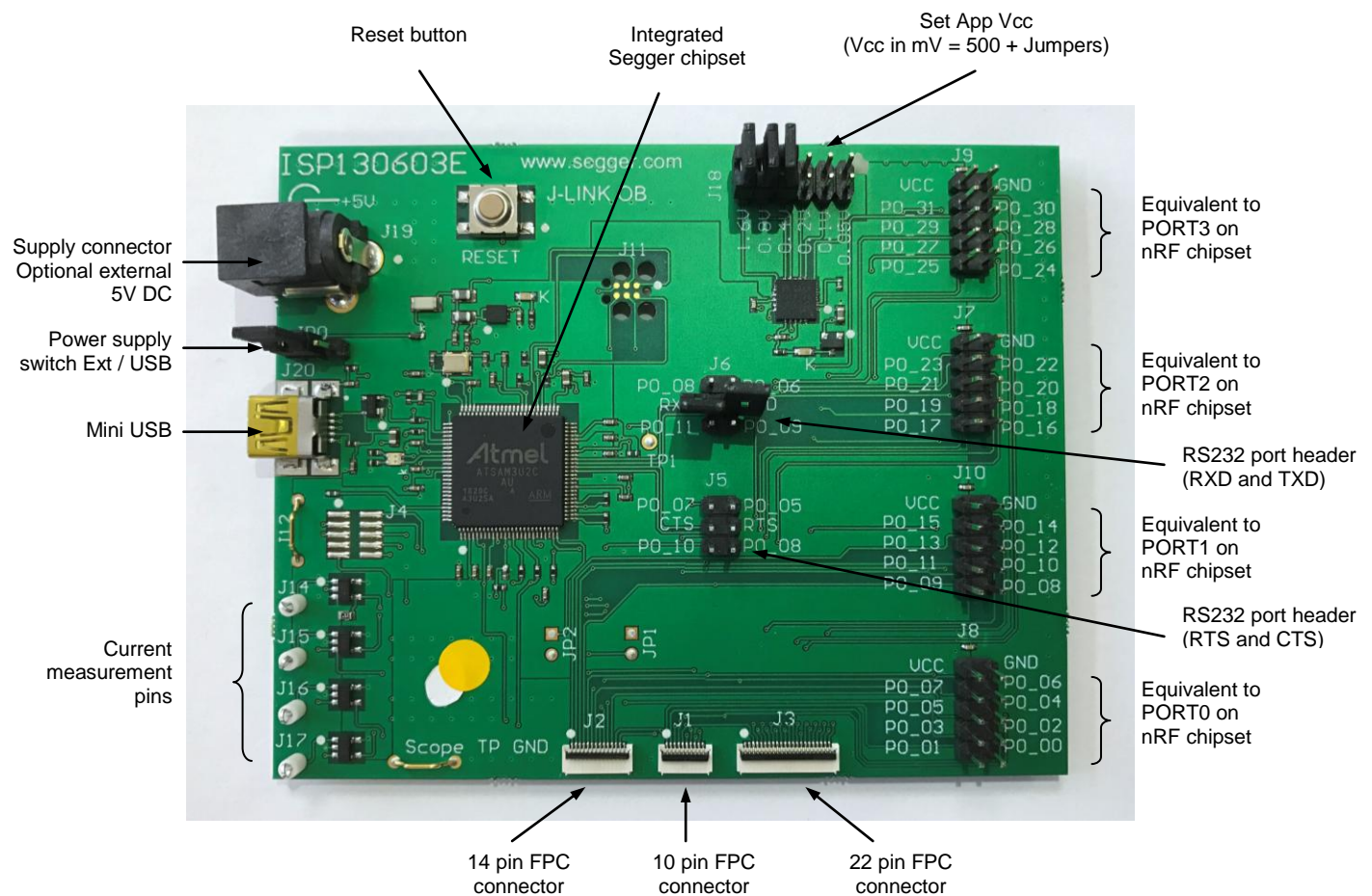
It encloses:

- ✚ ISP1507AX BLE module
- ✚ 3 x FPC connectors in order to access the nRF52832 GPIOs:
  - 1 x 10 pin FPC connector on top side of the board.
  - 1 x 14 pin FPC connector on top side of the board.
  - 1 x 22 pin FPC connector on bottom side of the board.
  - 1 x 3 pin header
  - 2 x jumpers to connect IO on the 3 pin header as described on the picture above.

The ISP1507AX-TB electrical schematic is presented in document Schematic\_ISP1507-AX-TB.

### 4.3. ISP130603 Interface Board

ISP130603 is the application type interface board that has dimensions of 100 x 80 mm<sup>2</sup>.  
The ISP130603 electrical schematic is presented in document SC130604.



#### 4.4. ISP131001 Sensors Board

ISP131001 is the sensor application board that has dimensions of 12.5 x 25 mm<sup>2</sup>.

It encloses:

- ✚ ISP130301-BM BLE module.
- ✚ ST Micro LPS331AP temperature and barometer sensor.
- ✚ Freescale FXOS8700CQ 6-axis linear accelerometer and magnetometer sensor.
- ✚ Rohm SML-P11MTT86 mini-LED.
- ✚ Software to read/drive the sensors.
- ✚ Removable 10 pin FPC connector for software loading.

The ISP131001 electrical schematic is presented in document SC131002.

#### 4.5. nRF5 series Development Dongle

The reader should refer to the corresponding paragraph in nRF52832 Development Kit User Guide document.





### 5. Basic Application using ISP1507AX-TB Test Board

#### 5.1. Basic BLE Proximity Application

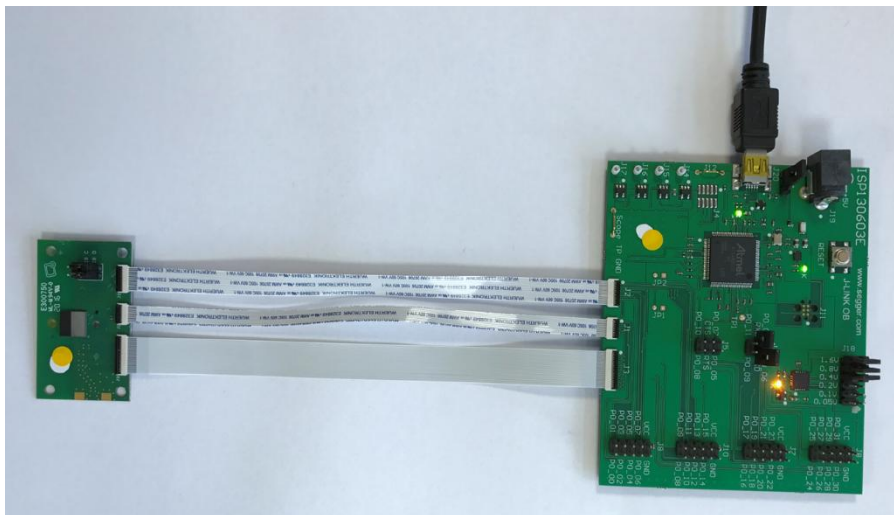
This paragraph shows you how to set up and program a BLE proximity application on top of a SoftDevice that will send data on a Bluetooth link from the ISP1507AX-TB Test Board to the Master Emulator. In order to use Bluetooth Low Energy radio, the software is loaded in 2 parts:

- ✚ S132 SoftDevice using nRFgo Studio (hex file, no source).
- ✚ Proximity Application using Keil uVision.

Then Master Emulator is connected and Proximity Application is launched.

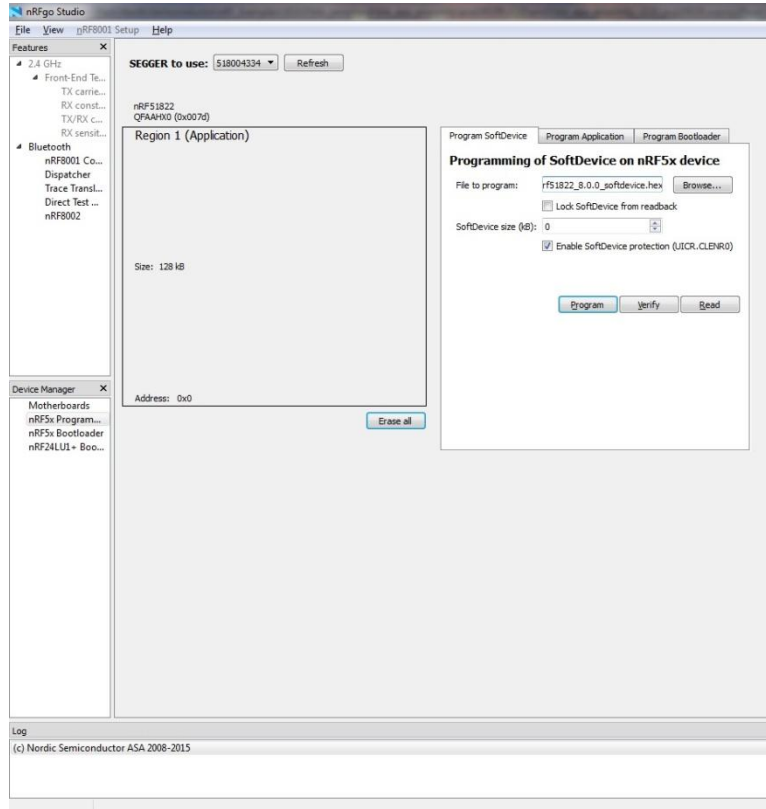
#### S132 SoftDevice loading

1. Connect the provided USB cable from the Interface Board ISP130603 to your computer.
2. Connect the ISP1507AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit).



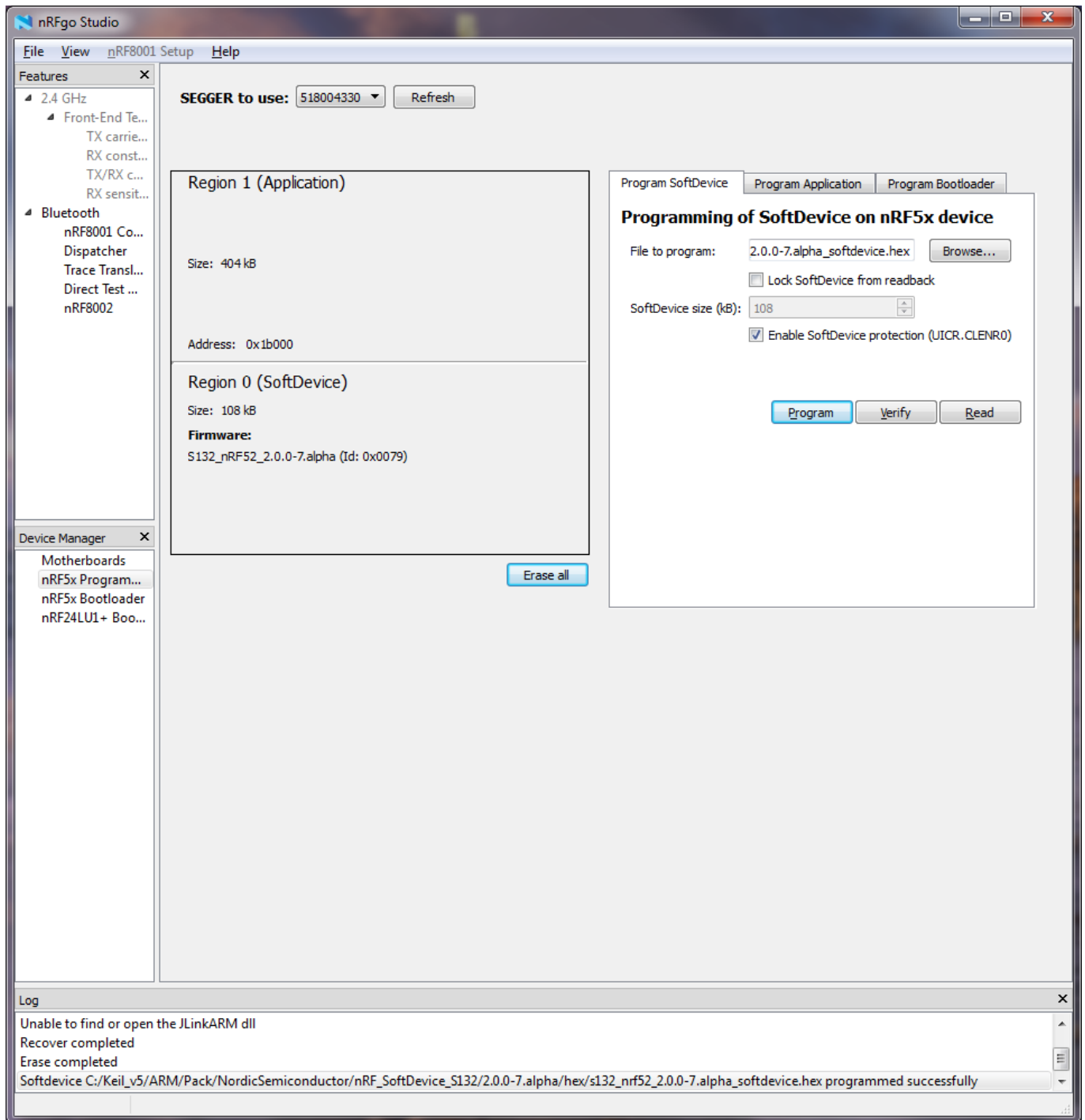
3. Start nRFgo Studio.
4. Select nRF5x Programming.
5. Click Erase all.





6. Browse to SoftDevice hex file and click Program. The SoftDevice is available on the Nordic Website or by installing the SoftDevice S132 with the Pack Installer, for example :  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\nRF\_SoftDevice\_S132\2.0.0-7.alpha\hex

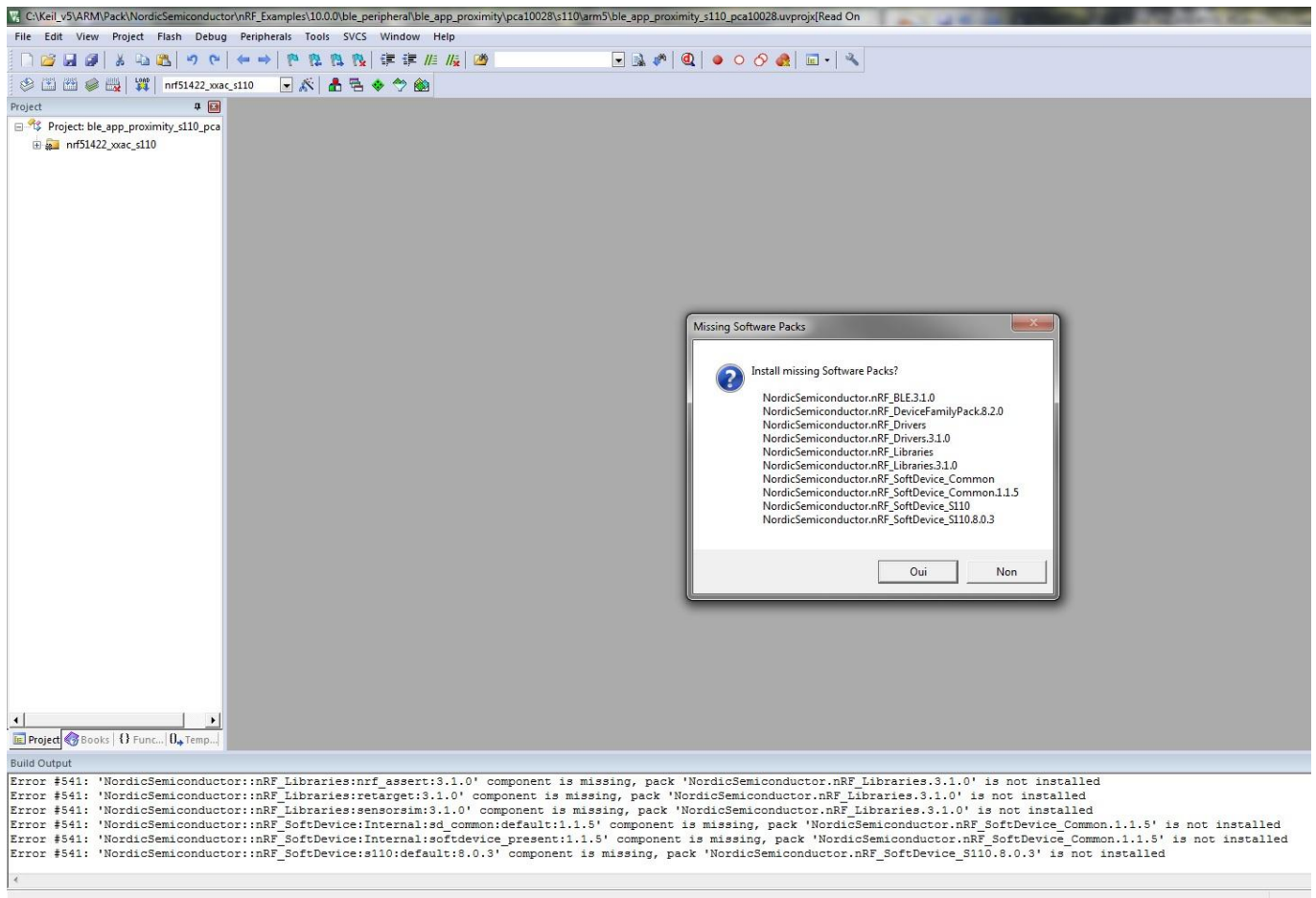




### Proximity Application loading

1. Start Keil uVision.
2. Select Project then Open Project in order to open Proximity app. Make sure it is the right file project. The project is locked, it is read only, if you want to modify it, you have to change the right in the file App directory properties.

(Ex: C:\Keil\_v5\ARM\Pack\NordicSemiconductor\NRF\_Examples\11.0.0-2.alpha\ble\_peripheral\ble\_app\_proximity\pca10040\132\arm5\ble\_app\_proximity\_s132\_pca10040.uvprojx).



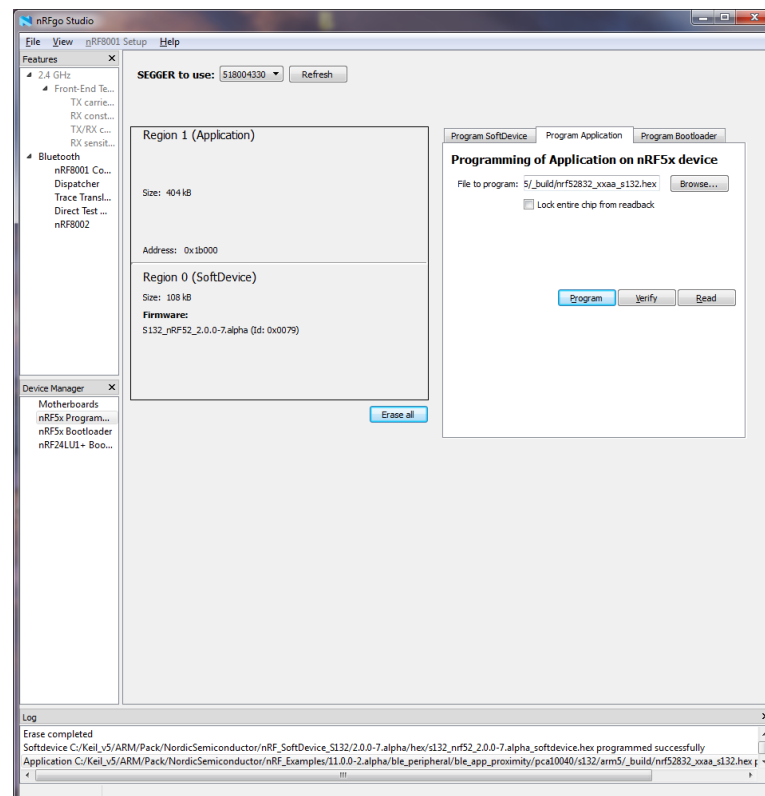
If some Install Softwares Packs is missing, a window appears, and you can install it.



- Click Build Target and Load. If you have this message after click Load, it means that the power is not enough and you have to increase the voltage by adding jumpers on the interface board.



You can also load the hex file (generated after building target with keil uVision) by nRFgo studio in the program application.



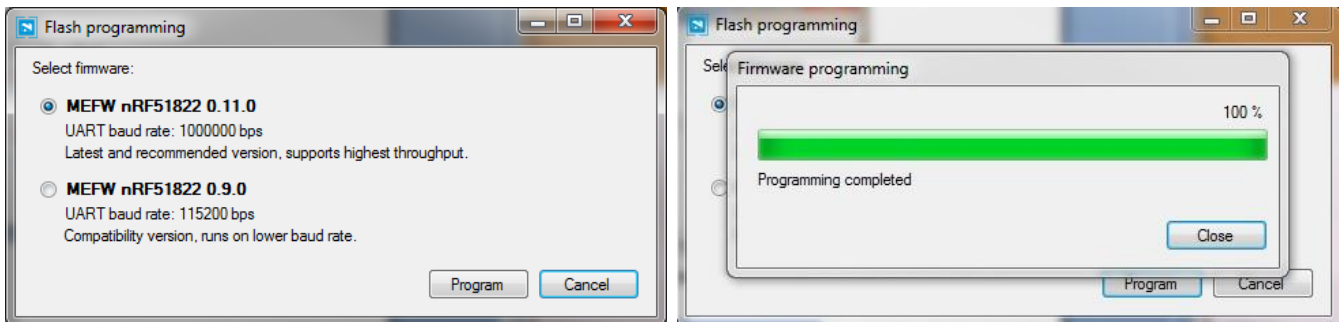
The file project is located for example:

*C:\Keil\_v5\ARM\Pack\NordicSemiconductor\NRF\_Examples\11.0.0-2.alpha\ble\_peripheral\ble\_app\_proximity\pca10040\sl32\arm5\\_build\\_build\ nrf52832\_xxaa\_sl32.hex).*

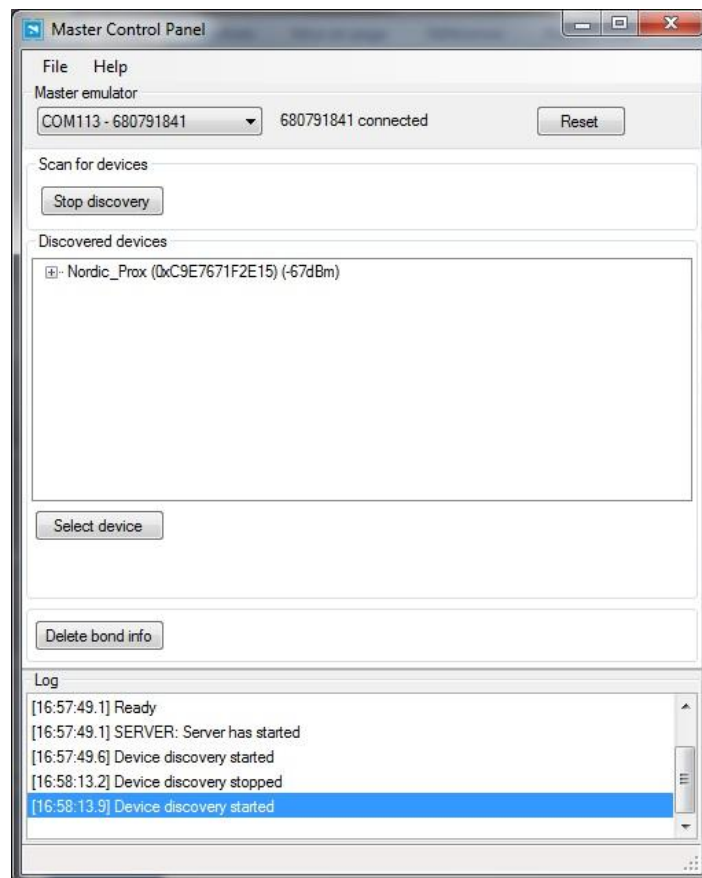


### Master Emulator and Proximity Application

1. Connect nRF51 Dongle (Master Emulator) into a USB port on your computer.
2. Start Master Control Panel. If you have no master emulator found, you have to flash the dongle in Flash programming section.

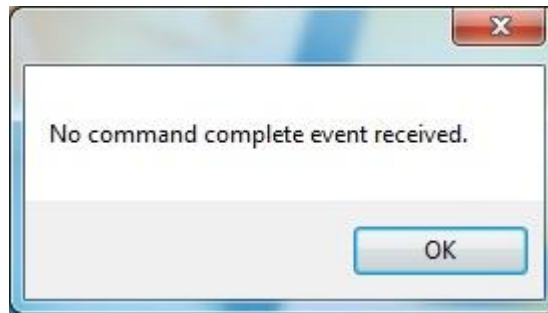


3. Click Start Discovery.





4. After starting discovery, if no device appearing, disconnect and connect again the interface board power supply.
5. If you have an error message as indicated in the photo :

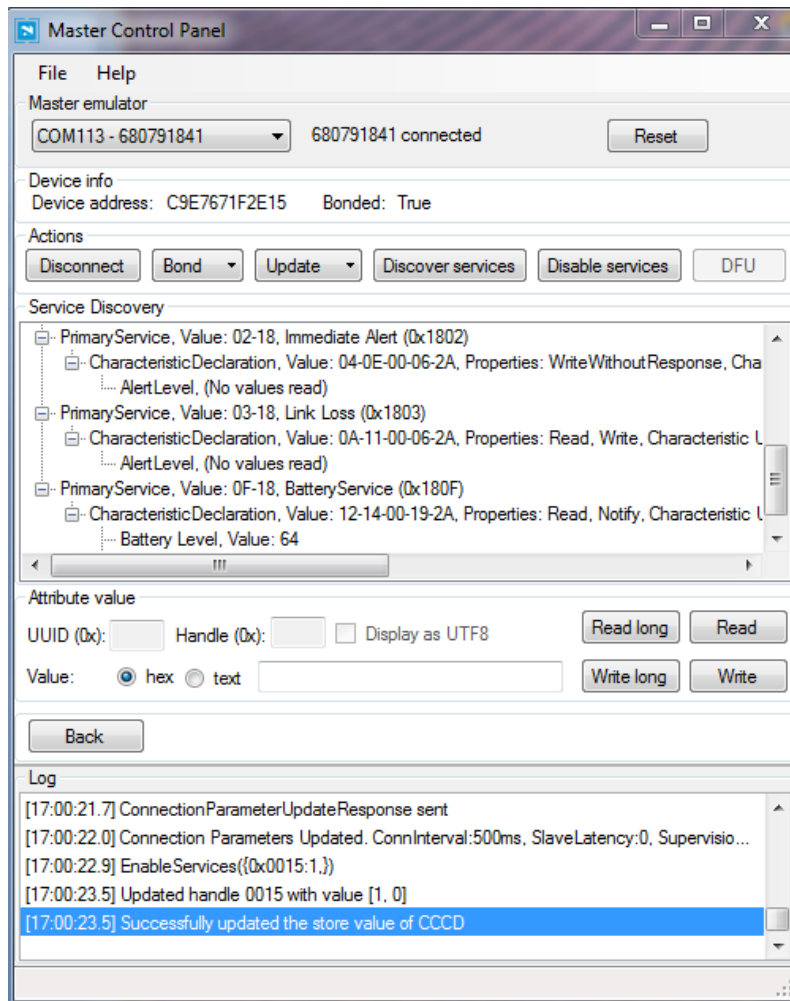


It means that the nRF5 Dongle is not programmed. For your information, please refer to the nRF51822 Development Kit User Guide document as indicated in our application note ISP130301-DK1 part 4.5 on page 14-7. You can find this user guide on the Nordicsemi website. The procedure to program the nRF51 Dongle is described on page 13. I enclose a copy of the user guide for your convenience.

- 1) *Open the Master Control Panel from the Start menu (Start > All Programs > Nordic Semiconductor > Master Control Panel).*
- 2) *Make sure the Development Dongle is detected. The Master Emulator item list should show COMnn-xxxxxxxx (nn gives the COM port number; xxxxxxxx is the SEGGER serial number printed on the dongle). Restart the application if it doesn't appear in the item list. Before continuing, make sure you have selected the correct device by verifying the serial number in the item list with the serial number printed on the Development Dongle.*
- 3) *When you use the Development Dongle for the first time, you must first program it with the Master Emulator Firmware.*
  - a. *In the Master Control Panel menu click File and select Flash Programming.*
  - b. *Click Browse. This opens a browser that automatically points to the location of the*
  - c. *mefw\_nrf51822\_<version>\_firmware.hex (<version> will be replaced by a number*
  - d. *giving the version of the actual firmware).*
  - e. *The Master Control Panel Firmware file is located in:*
  - f. *C:\Program Files (x86) \ Nordic Semiconductor \ Master Control Panel \<version>firmware\*
  - g. *pca10000MEFW\_nRF51822\_<version>\_firmware.hex.*
  - h. *Select the Master Emulator Firmware file and click Open.*
  - i. *Click Program to start programming the selected device.*
  - j. *When the programming is finished click Exit to go back to the main window.*

6. Click Select Device.
7. On the following display, click successively on Bond, Discover Services and Enable Services.





8. You can note Battery voltage is sent by the ISP1507AX-TB Test Board to the Master Emulator via the Bluetooth link. The application is written to send a value that changes cyclically.
9. You can also use the “nRF Master Control Panel” application which is available for iOS from Apple Store and for Android from Play Store. Download, install and run the application, click to SCAN and select the device: Nordic\_PROX.

**Important notification:** Pay attention to the compatibility between the IC revision, the SoftDevice, the nRF5 SDK, etc, ... Please read the compatibility matrix available on the “infocenter” website from Nordic.

<http://infocenter.nordicsemi.com/index.jsp>



### 5.2. Direct Test Mode (UART)

This paragraph shows you how to set up and program the Direct Test Mode through the UART on ISP1507AX-TB Test Board.

#### Direct Test Mode Set-up

1. Connect the USB cable from the Interface Board ISP130603 to your computer.
2. Connect the ISP1507AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
  - RXD to P0\_08
  - TXD to P0\_06

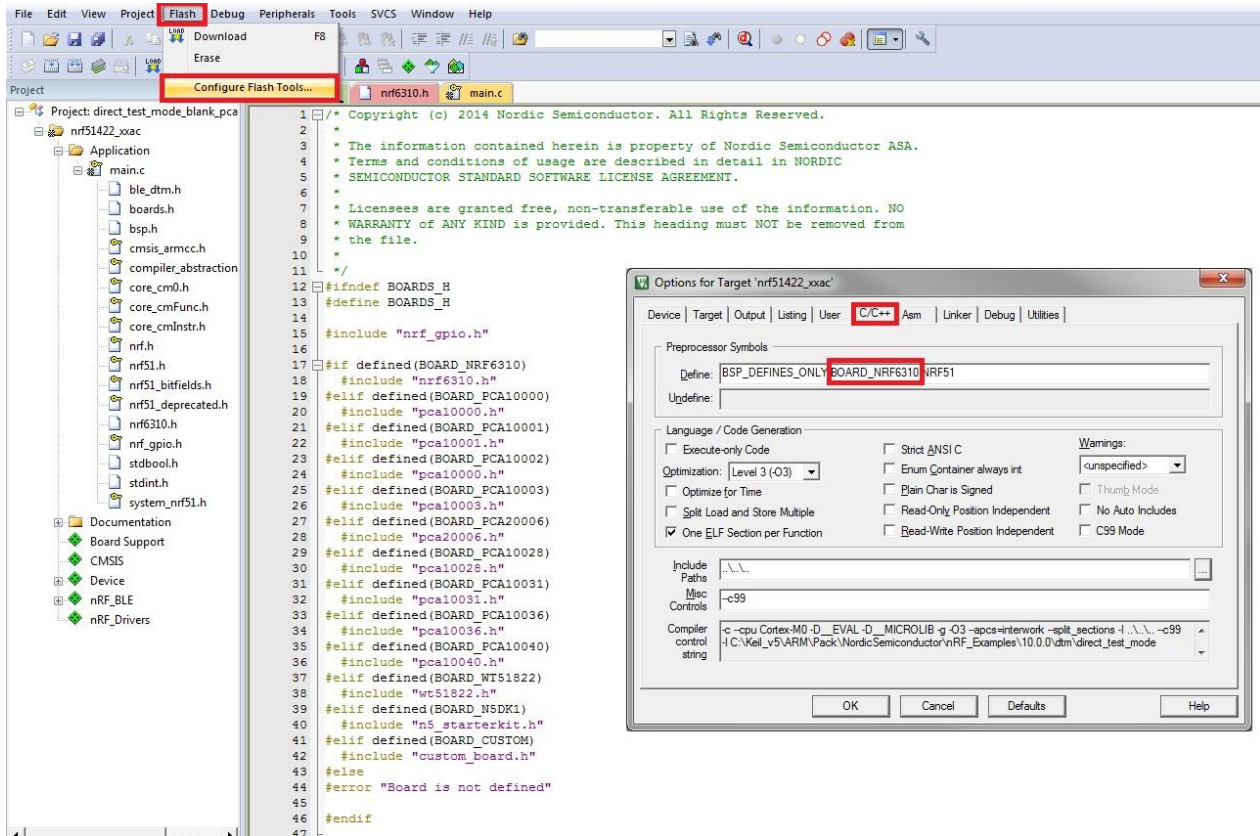
Make sure the RXD/TXD labels match for each wire. This matches the default setting if you are using the Nordic Board PCA10040 in the SDK project (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: Direct Test Mode loading).

#### Direct Test Mode Loading

1. Start Keil uVision.
2. Select Project then Open Project in order to open Direct Test Mode application:  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\NRF\_Examples\11.0.0-2.alpha\dtm\direct\_test\_mode\pca10040\blank\arm5\direct\_test\_mode\_blank\_pca10040.uvprojx.

Warning: Regarding the Nordic Board you are using, the RX and TX pin number could be different. In the following pictures, the Nordic board PCA10040 is used (you can modify the Nordic Board model in : Flash → Configure Flash Tools → C/C++, by writing the correct Board name in the “Define” area with the name indicated in the boards.h).





In the following picture, the Nordic board PCA10040 is used by default and the RX and TX pin number are 08 and 06.





```

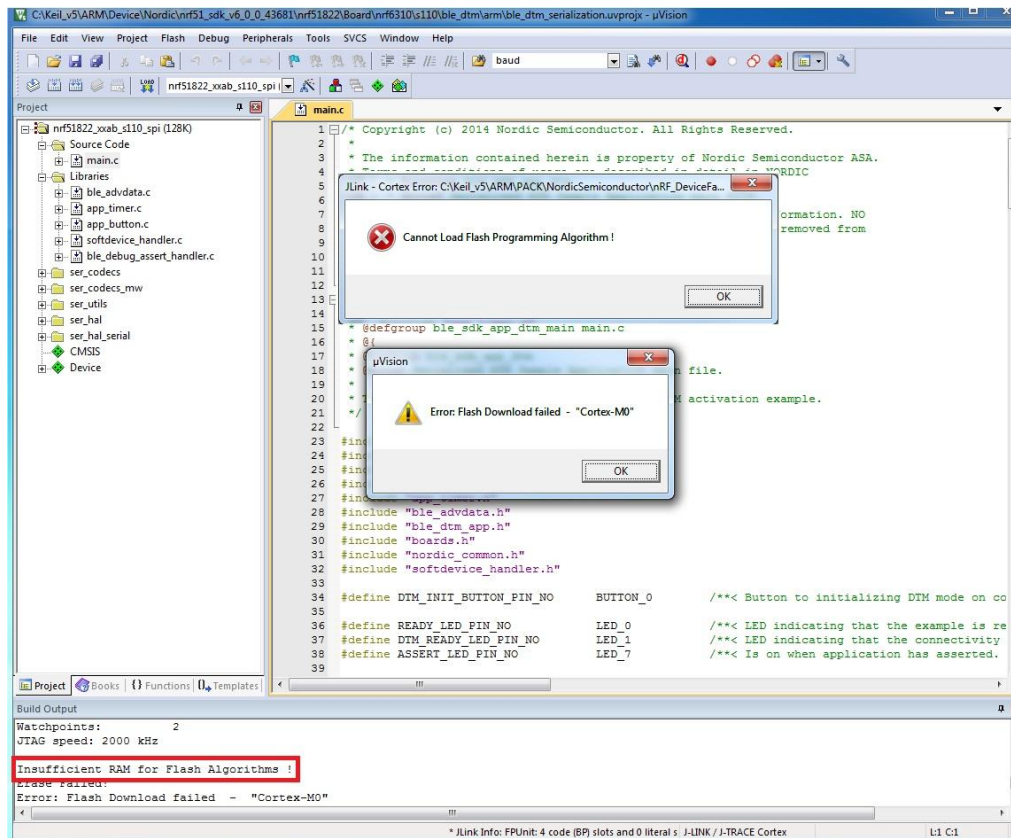
34 #define BSP_LED_2_MASK (1<<BSP_LED_2)
35 #define BSP_LED_3_MASK (1<<BSP_LED_3)
36
37 #define LEDS_MASK      (BSP_LED_0_MASK | BSP_LED_1_MASK | BSP_LED_2_MASK | BSP_LED_3_MASK)
38 /* all LEDs are lit when GPIO is low */
39 #define LEDS_INV_MASK  LEDS_MASK
40
41 #define BUTTONS_NUMBER 4
42
43 #define BUTTON_START   13
44 #define BUTTON_1       13
45 #define BUTTON_2       14
46 #define BUTTON_3       15
47 #define BUTTON_4       16
48 #define BUTTON_STOP    16
49 #define BUTTON_PULL    NRF_GPIO_PIN_PULLUP
50
51 #define BUTTONS_LIST { BUTTON_1, BUTTON_2, BUTTON_3, BUTTON_4 }
52
53 #define BSP_BUTTON_0    BUTTON_1
54 #define BSP_BUTTON_1    BUTTON_2
55 #define BSP_BUTTON_2    BUTTON_3
56 #define BSP_BUTTON_3    BUTTON_4
57
58 #define BSP_BUTTON_0_MASK (1<<BSP_BUTTON_0)
59 #define BSP_BUTTON_1_MASK (1<<BSP_BUTTON_1)
60 #define BSP_BUTTON_2_MASK (1<<BSP_BUTTON_2)
61 #define BSP_BUTTON_3_MASK (1<<BSP_BUTTON_3)
62
63 #define BUTTONS_MASK    0x001E0000
64
65 #define RX_PIN_NUMBER   8
66 #define TX_PIN_NUMBER   6
67 #define CTS_PIN_NUMBER  7
68 #define RTS_PIN_NUMBER  5
69 #define HWFC            true
70
71 #define SPIS_MISO_PIN    28 // SPI MISO signal.
72 #define SPIS_CSN_PIN     12 // SPI CSN signal.
73 #define SPIS_MOSI_PIN    25 // SPI MOSI signal.
74 #define SPIS_SCK_PIN     29 // SPI SCK signal.
75
76 #define SPIMO_SCK_PIN    29 // SPI clock GPIO pin number.
77 #define SPIMO_MOSI_PIN   25 // SPI Master Out Slave In GPIO pin number.
78 #define SPIMO_MISO_PIN   28 // SPI Master In Slave Out GPIO pin number.
79 #define SPIMO_SS_PIN     12 // SPI Slave Select GPIO pin number.
80
81 #define SPIM1_SCK_PIN    2 // SPI clock GPIO pin number.

```

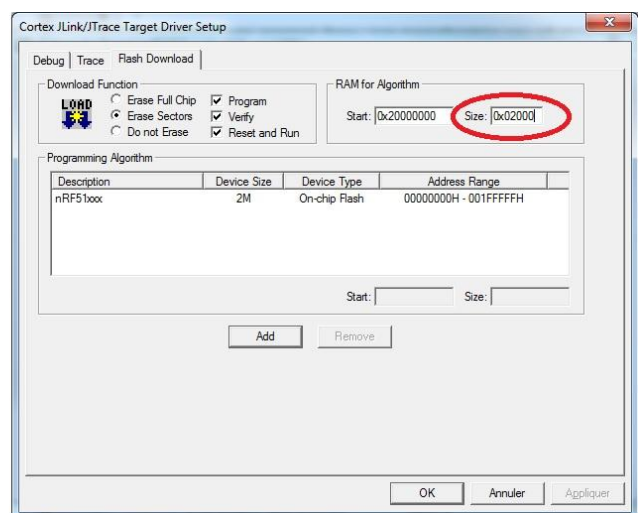
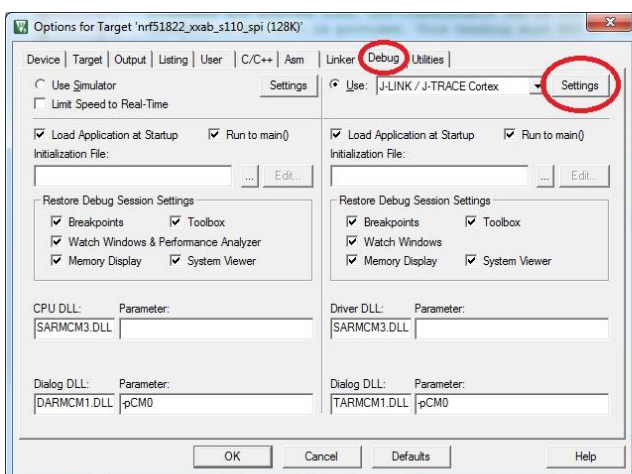
3. Click Build Target and Load.
4. If you have the next error message, it means that you have not enough RAM to flash algorithm.







5. You can modify the size of the RAM Algorithm in :  
*Flash* → *Configure Flash Tools...* and on the windows click on *Debug* → *Settings*  
 Click on *Flash Download* and modify the size (put 0x02000).



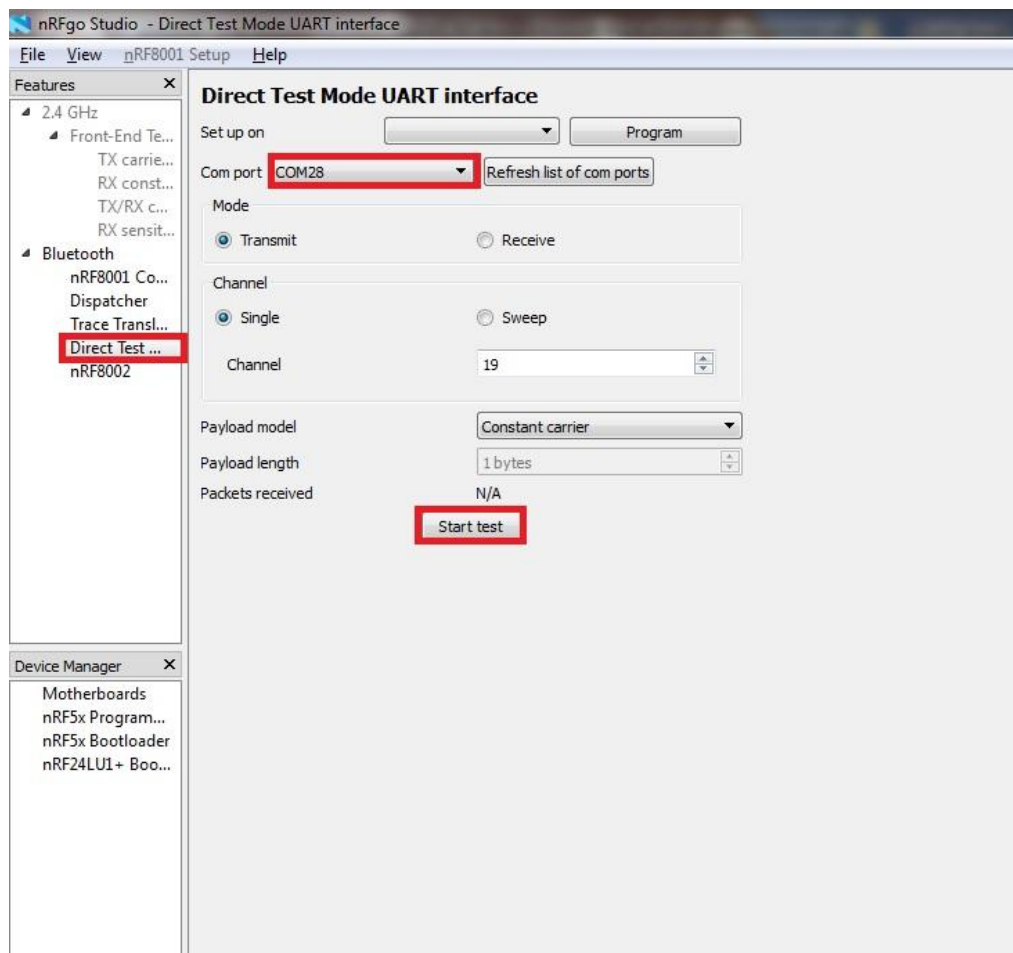
6. Click OK and load again the project.





### Direct Test Mode Testing

1. Start nRFgo Studio.
2. Select Direct Test Mode.



3. For details on how to use the Direct Test Mode, press F1 to open the nRFgo Studio help.

**Important notification:** Erase all before loading Direct Test Mode program. The SoftDevice must not be loaded, only the Program Application with uvision or with nRFgo studio in "Program Application" (load the .hex generated by uvision).



### 5.3. UART Mode Example

This paragraph shows you how to set up and program a communication by sending some characters through the UART interface on ISP1507AX-TB Test Board. This example just echoes input characters from the PC terminal.

#### UART Mode Set-up

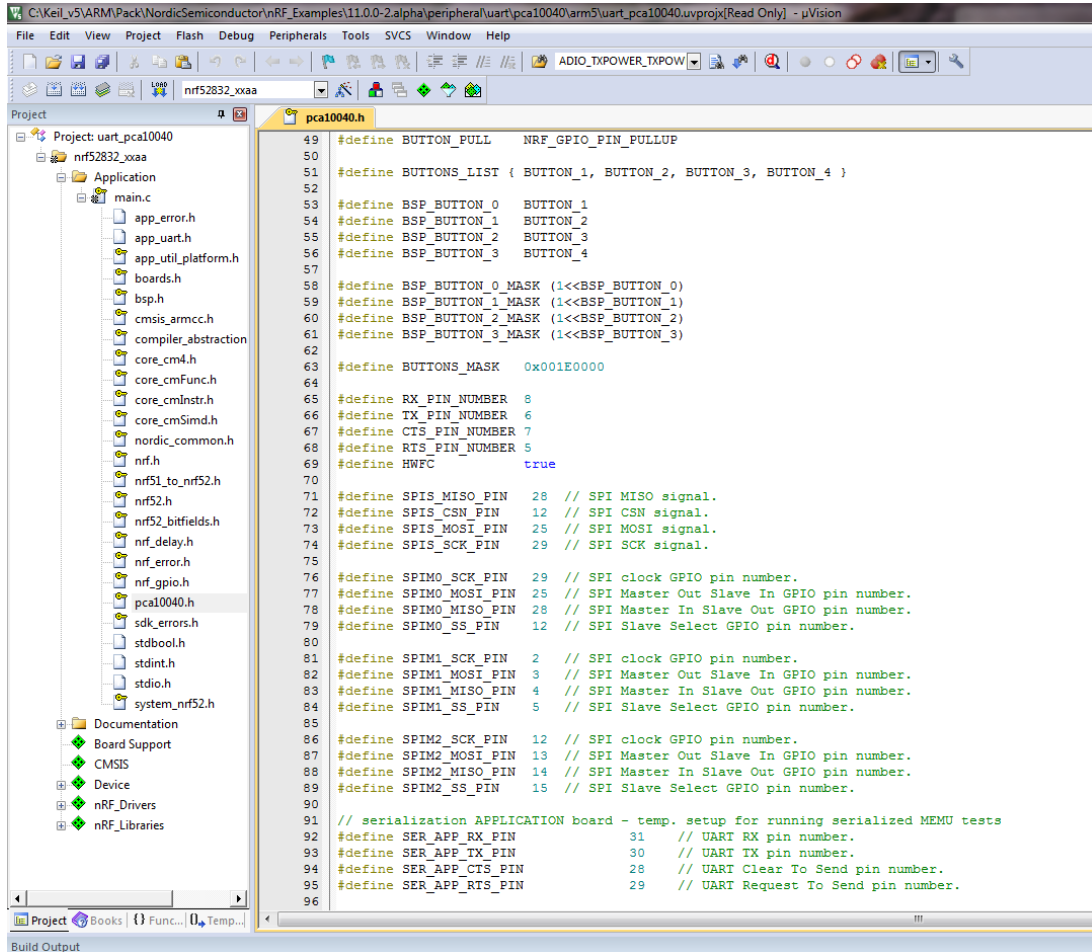
1. Connect the USB cable from the Interface Board ISP130603 to your computer.
2. Connect the ISP1507AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
  - RXD to P0\_08
  - TXD to P0\_06
  - CTS to P0\_07
  - RTS to P0\_05

Make sure the RXD/TXD and CTS/RTS labels match for each wire. This matches the default setting if you are using the Nordic Board pca10040 in the SDK project (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: UART Mode loading). CTS and RTS are needed because in the UART process when the TX is ready to send (RTS), the RX needs to allow the TX send datas (CTS) and vice versa.

#### UART Mode Loading

1. Start Keil uVision.
2. Select Project then Open Project in order to open UART\_example application:  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\RF\_Examples\11.0.0-2.alpha\peripheral\uart\pca10040\arm5\uart\_pca10040.uvprojx.





```

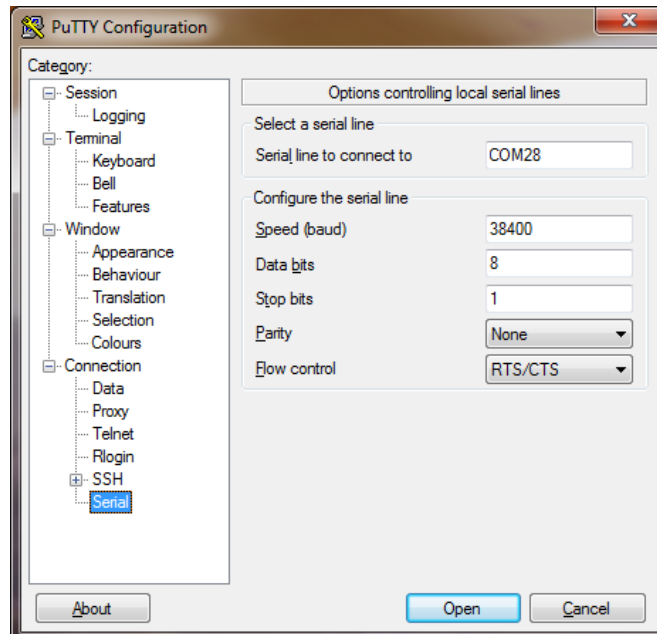
49 #define BUTTON_PULL NRF_GPIO_PIN_PULLUP
50
51 #define BUTTONS_LIST { BUTTON_1, BUTTON_2, BUTTON_3, BUTTON_4 }
52
53 #define BSP_BUTTON_0 BUTTON_1
54 #define BSP_BUTTON_1 BUTTON_2
55 #define BSP_BUTTON_2 BUTTON_3
56 #define BSP_BUTTON_3 BUTTON_4
57
58 #define BSP_BUTTON_0_MASK (1<<BSP_BUTTON_0)
59 #define BSP_BUTTON_1_MASK (1<<BSP_BUTTON_1)
60 #define BSP_BUTTON_2_MASK (1<<BSP_BUTTON_2)
61 #define BSP_BUTTON_3_MASK (1<<BSP_BUTTON_3)
62
63 #define BUTTONS_MASK 0x001E0000
64
65 #define RX_PIN_NUMBER 8
66 #define TX_PIN_NUMBER 6
67 #define CTS_PIN_NUMBER 7
68 #define RTS_PIN_NUMBER 5
69 #define HWFC true
70
71 #define SPIS_MISO_PIN 28 // SPI MISO signal.
72 #define SPIS_CSN_PIN 12 // SPI CSN signal.
73 #define SPIS_MOSI_PIN 25 // SPI MOSI signal.
74 #define SPIS_SCK_PIN 29 // SPI SCK signal.
75
76 #define SPIM0_SCK_PIN 29 // SPI clock GPIO pin number.
77 #define SPIM0_MOSI_PIN 25 // SPI Master Out Slave In GPIO pin number.
78 #define SPIM0_MISO_PIN 28 // SPI Master In Slave Out GPIO pin number.
79 #define SPIM0_SS_PIN 12 // SPI Slave Select GPIO pin number.
80
81 #define SPIM1_SCK_PIN 2 // SPI clock GPIO pin number.
82 #define SPIM1_MOSI_PIN 3 // SPI Master Out Slave In GPIO pin number.
83 #define SPIM1_MISO_PIN 4 // SPI Master In Slave Out GPIO pin number.
84 #define SPIM1_SS_PIN 5 // SPI Slave Select GPIO pin number.
85
86 #define SPIM2_SCK_PIN 12 // SPI clock GPIO pin number.
87 #define SPIM2_MOSI_PIN 13 // SPI Master Out Slave In GPIO pin number.
88 #define SPIM2_MISO_PIN 14 // SPI Master In Slave Out GPIO pin number.
89 #define SPIM2_SS_PIN 15 // SPI Slave Select GPIO pin number.
90
91 // serialization APPLICATION board - temp. setup for running serialized MEMU tests
92 #define SER_APP_RX_PIN 31 // UART RX pin number.
93 #define SER_APP_TX_PIN 30 // UART TX pin number.
94 #define SER_APP_CTS_PIN 28 // UART Clear To Send pin number.
95 #define SER_APP_RTS_PIN 29 // UART Request To Send pin number.
96
  
```

3. Click Build Target and Load.

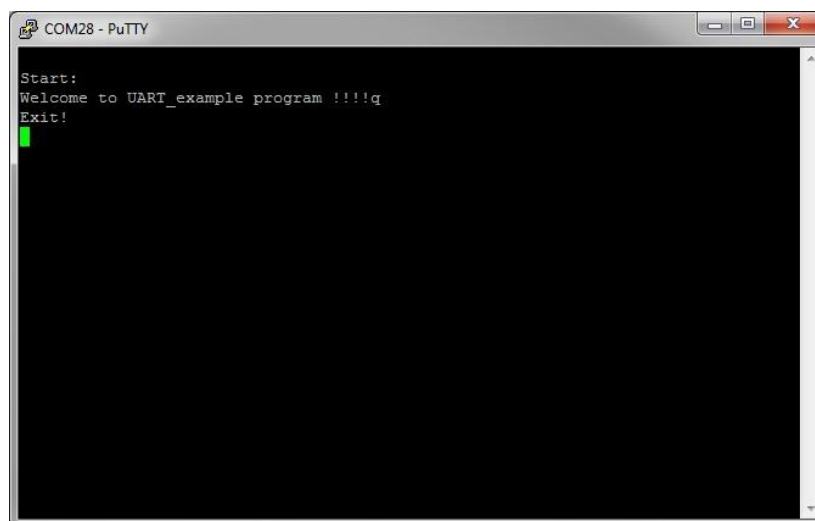


### UART Mode Testing

1. Download and install the program "Putty.exe" (or equivalent like TTERM for example) in order to configure the baudrate, the port COM, .. etc ...



2. Click to Open.
3. You can write and/or delete some characters. Sometimes you have to reset the ISP130603 Interface Board in case if it is not working.



4. Press 'q' to exit



### 5.4. BLE UART Mode Example

This paragraph shows you how to set up and program an example that emulates a serial port over BLE. In the example, Nordic Semiconductor's development board serves as a peer to the phone application "nRF UART", which is available for iOS from Apple Store and for Android from Play Store. In addition, the example demonstrates how to use a proprietary (vendor-specific) service and characteristics with the SoftDevice. In order to use Bluetooth Low Energy and UART interface, the software is loaded in 2 parts:

- The SoftDevice: **S132**.
- ble\_app\_uart using Keil uVision.

### UART Mode Set-up

1. Connect the USB cable from the Interface Board ISP130603 to your computer.
2. Connect the ISP1507AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
  - RXD to P0\_08
  - TXD to P0\_06
  - CTS to P0\_07
  - RTS to P0\_05

Make sure the RXD/TXD and CTS/RTS labels match for each wire (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: UART Mode loading).

CTS and RTS are needed because in the UART process when the TX is ready to send (RTS), the RX needs to allow the TX send datas (CTS) and vice versa.

### S132 SoftDevice loading

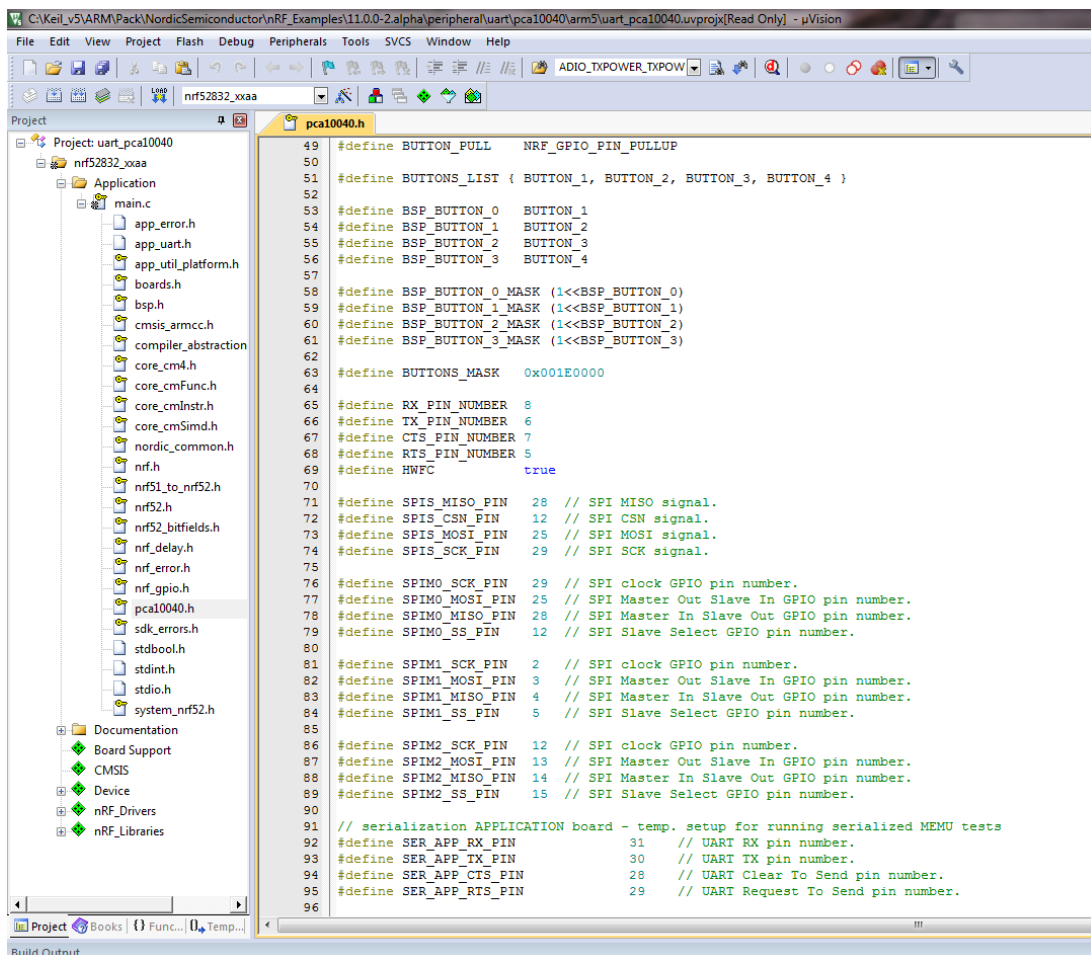
1. Start nRFgo Studio
2. Select nRF5x Programming
3. Click Erase all
4. Browse to SoftDevice hex file and click Program. The SoftDevice is available on the Nordic Website or by installing the SoftDevice with the Pack Installer, for example:  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\nRF\_SoftDevice\_S132\2.0.0-7.alpha\hex



### UART Mode Loading

1. Start Keil uVision.
2. Select Project then Open Project in order to open ble\_app\_uart application:  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\NRF\_Examples\11.0.0-2.alpha\ble\_peripheral\ble\_app\_uart\pca10040\s132\arm5\ble\_app\_uart\_s132\_pca10040.
3. Click Build Target and Load.

Insight SiP can provide the Hex files on demand at [contact@insightsip.com](mailto:contact@insightsip.com)



```

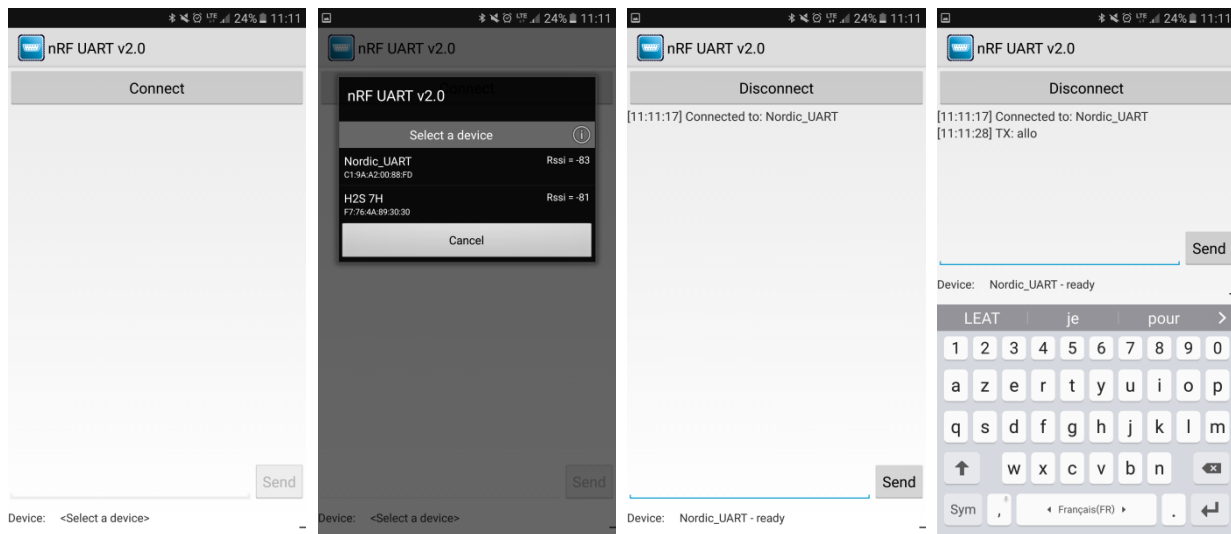
49 #define BUTTON_PULL NRF_GPIO_PIN_PULLUP
50
51 #define BUTTONS_LIST { BUTTON_1, BUTTON_2, BUTTON_3, BUTTON_4 }
52
53 #define BSP_BUTTON_0 BUTTON_1
54 #define BSP_BUTTON_1 BUTTON_2
55 #define BSP_BUTTON_2 BUTTON_3
56 #define BSP_BUTTON_3 BUTTON_4
57
58 #define BSP_BUTTON_0_MASK (1<<BSP_BUTTON_0)
59 #define BSP_BUTTON_1_MASK (1<<BSP_BUTTON_1)
60 #define BSP_BUTTON_2_MASK (1<<BSP_BUTTON_2)
61 #define BSP_BUTTON_3_MASK (1<<BSP_BUTTON_3)
62
63 #define BUTTONS_MASK 0x001E0000
64
65 #define RX_PIN_NUMBER 8
66 #define TX_PIN_NUMBER 6
67 #define CTS_PIN_NUMBER 7
68 #define RTS_PIN_NUMBER 5
69 #define HWFC true
70
71 #define SPIS_MISO_PIN 28 // SPI MISO signal.
72 #define SPIS_CSN_PIN 12 // SPI CSN signal.
73 #define SPIS_MOSI_PIN 25 // SPI MOSI signal.
74 #define SPIS_SCK_PIN 29 // SPI SCK signal.
75
76 #define SPIM0_SCK_PIN 29 // SPI clock GPIO pin number.
77 #define SPIM0_MOSI_PIN 25 // SPI Master Out Slave In GPIO pin number.
78 #define SPIM0_MISO_PIN 28 // SPI Master In Slave Out GPIO pin number.
79 #define SPIM0_SS_PIN 12 // SPI Slave Select GPIO pin number.
80
81 #define SPIM1_SCK_PIN 2 // SPI clock GPIO pin number.
82 #define SPIM1_MOSI_PIN 3 // SPI Master Out Slave In GPIO pin number.
83 #define SPIM1_MISO_PIN 4 // SPI Master In Slave Out GPIO pin number.
84 #define SPIM1_SS_PIN 5 // SPI Slave Select GPIO pin number.
85
86 #define SPIM2_SCK_PIN 12 // SPI clock GPIO pin number.
87 #define SPIM2_MOSI_PIN 13 // SPI Master Out Slave In GPIO pin number.
88 #define SPIM2_MISO_PIN 14 // SPI Master In Slave Out GPIO pin number.
89 #define SPIM2_SS_PIN 15 // SPI Slave Select GPIO pin number.
90
91 // serialization APPLICATION board - temp. setup for running serialized MEMU tests
92 #define SER_APP_RX_PIN 31 // UART RX pin number.
93 #define SER_APP_TX_PIN 30 // UART TX pin number.
94 #define SER_APP_CTS_PIN 28 // UART Clear To Send pin number.
95 #define SER_APP_RTS_PIN 29 // UART Request To Send pin number.
96
  
```





### BLE Mode Testing

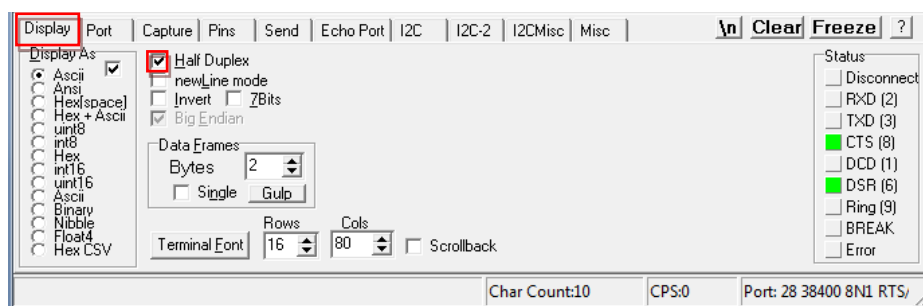
1. Download and install "nRF UART" on your iOS or Android device, which is available for iOS from Apple Store and for Android from Play Store.
2. Run the App, click to Connect and select the device: Nordic\_UART.

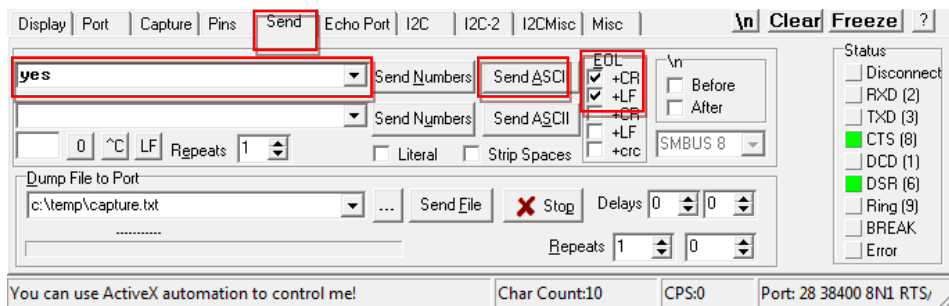
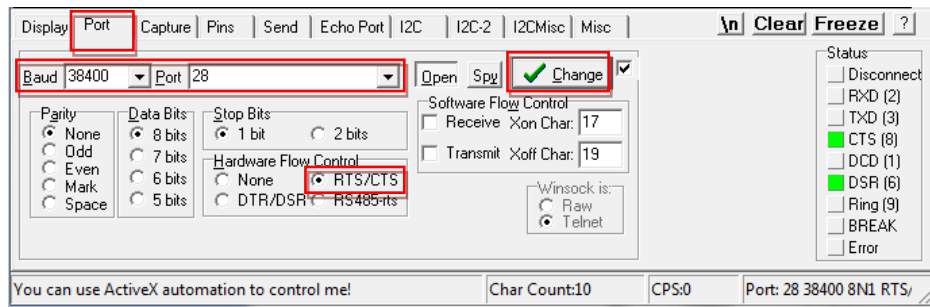


3. You are now able to send and receive data through the BLE. Next step is to establish the communication with the UART interface.

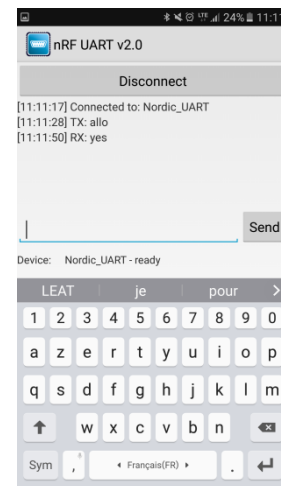
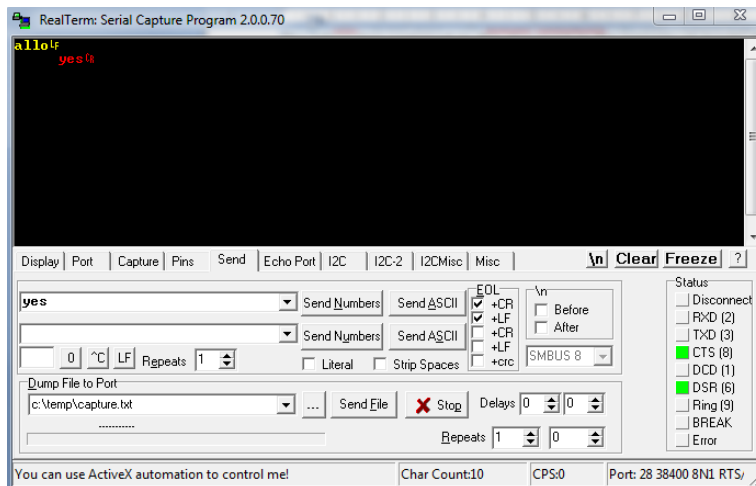
### UART Mode Testing

1. Download and install the program "RealTerm" (or equivalent like Putty, TTERM for example) in order to configure the baudrate, the port COM, .. etc ...





- Click to Send, write some characters and click to “Send ASCII”.



- The communication is established, you are now able to emulate a serial port over BLE.

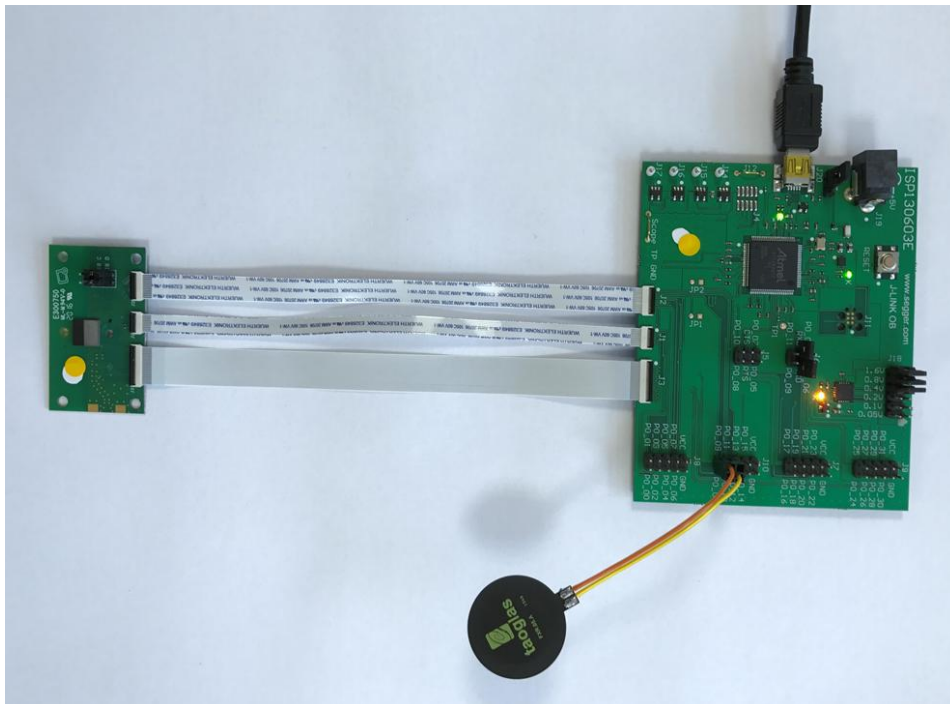


### 5.5. NFC Launch App Example

The Launch App Example shows how to use the NFC tag to launch an app on a device that supports NFC and runs Android (4.0 or later) or Windows Phone (8.0 or later).

#### NFC Mode Set-up

1. Connect the USB cable from the Interface Board ISP130603 to your computer.
2. Connect the ISP1507AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
  - NFC\_1 to P0\_09
  - NFC\_2 to P0\_10



### NFC Mode Loading

1. Start Keil uVision.
2. Select Project then Open Project in order to open UART\_example application:  
C:\Keil\_v5\ARM\Pack\NordicSemiconductor\NRF\_Examples\11.0.0-2.alpha  
\nfc\experimental\_record\_launch\_app\pca10040\arm5\nfc\_launchapp\_record\_pca10040.uvprojx.
3. Click Build Target and Load.

### NFC Mode Testing

Test the Launch App Example with a smartphone or a tablet with NFC support by performing the following steps:

1. After programming the application, touch the NFC antenna with the smartphone or tablet
2. Observe that the smartphone/tablet tries to:
  - Launch the nRF Toolbox app if it is installed.
  - Download the nRF Toolbox app from the store if it is not installed.





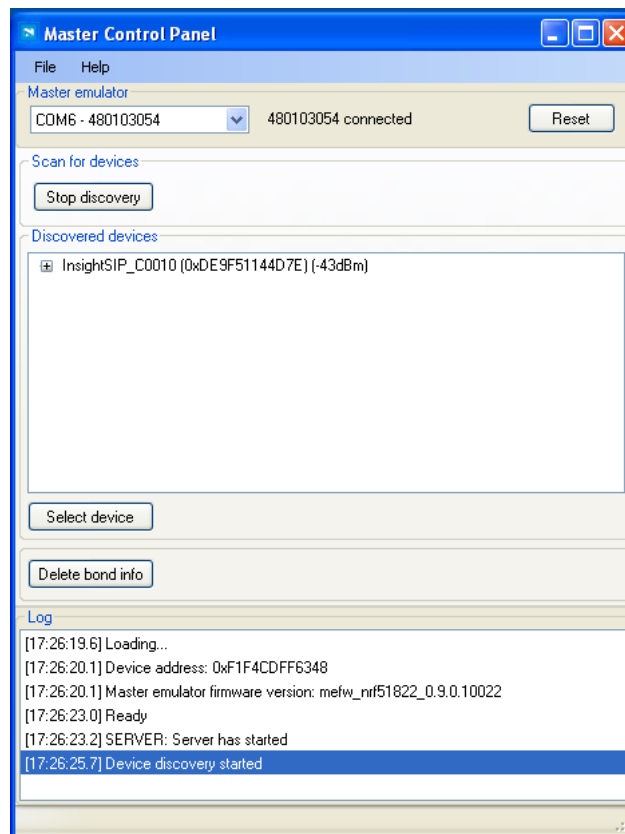
## 6. Basic Sensor Application with ISP131001

This paragraph shows you how to set up a Sensor application with ISP131001 Sensors Board that will send data via the Bluetooth link to the Master Emulator or to an Apple Device.

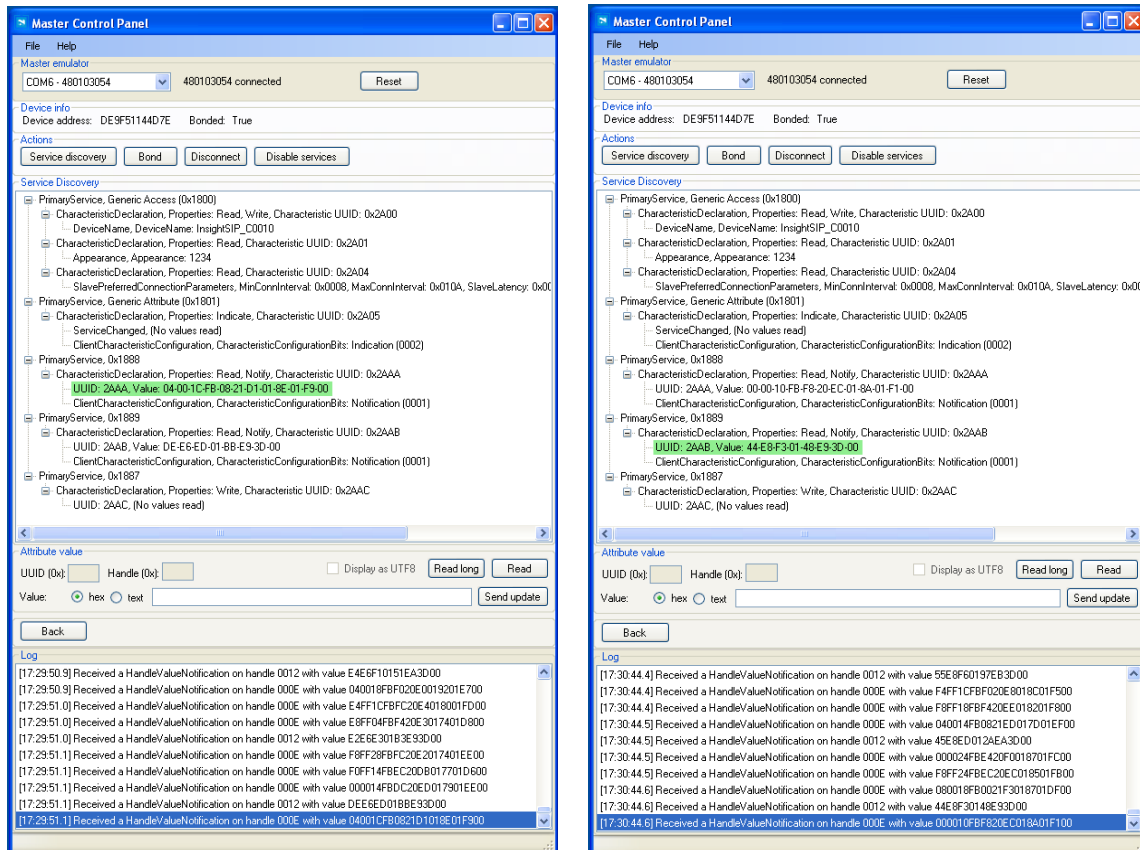
Two types of demonstration are presented. The first one is directly executable with hardware and software provided in the Development Kit using Master Control Panel application. The second demonstration requires the use of an iPhone or an iPad. The iOS application is available on the App Store.

### 6.1. On Master Control Panel

1. Place the CR2032 lithium battery into the battery holder.
2. Connect nRF51 Dongle (Master Emulator) into a USB port on your computer.
3. Start Master Control Panel.
4. Click Start Discovery.



5. Click Select Device.
6. On the following display, click successively on Bond, Discover Services and Enable Services.



7. You can note data that transit between the ISP131001 Sensors Board and the Master Emulator via the Bluetooth link:
  - Data of the accelerometer/magnetometer on the above left figure
  - Data of the temperature/pressure on the above right figure
8. To switch off ISP131001 Sensors Board, remove battery.





### 6.2. On iPhone or iPad Device

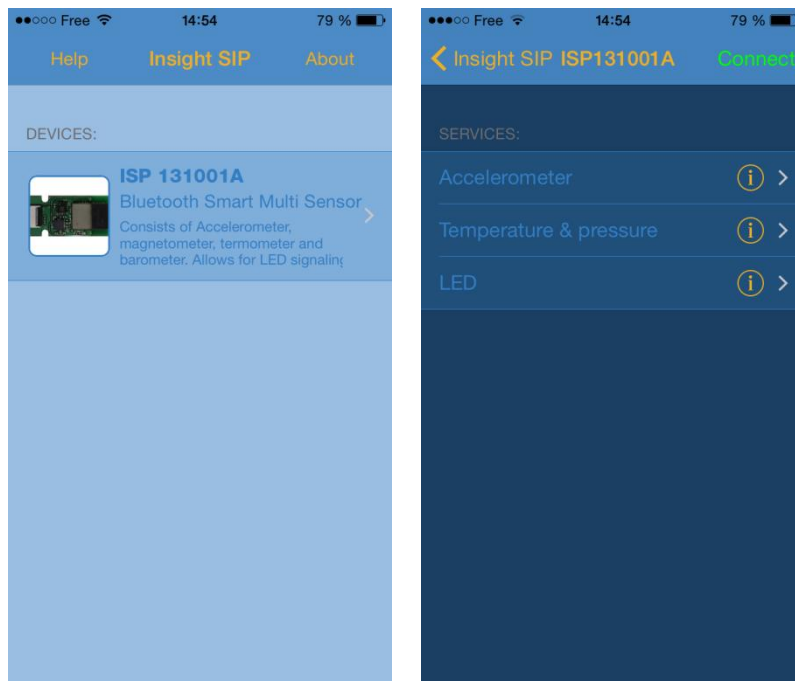
The Sensor application is only available on iOS device. On the App Store, search “sip sensor” or “insight sip” and download the App. The iOS App is a demonstration App that is provided "as is" in order to demonstrate the Smart Bluetooth sensor node. Only one iPhone or iPad is allowed per development kit.

Make sure you iOS device is compatible with Bluetooth 4.0 (iPhone 4S or higher, iPad Air, Mini, 3<sup>rd</sup> generation and above).

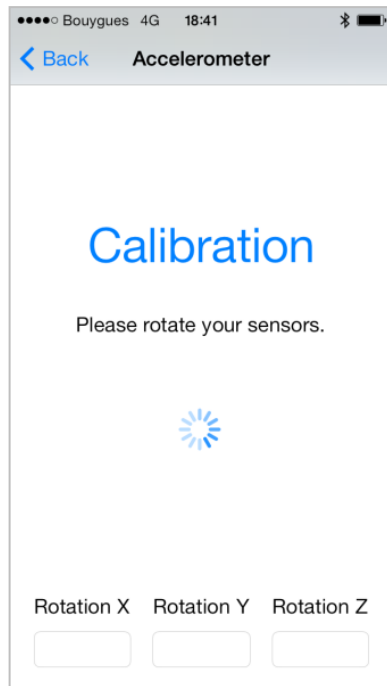
The “sip sensor” application is downloaded and installed. You should see the application on your iOS device.

Then you will be able to set up the application demonstration as follows:

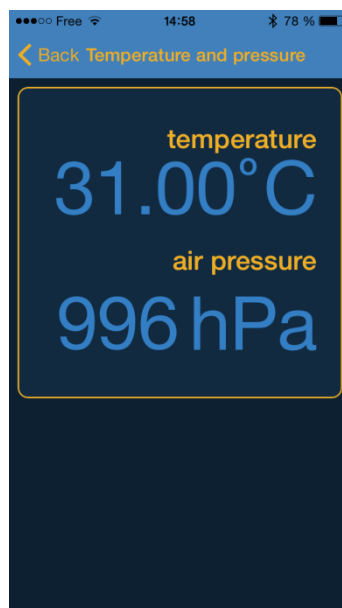
1. Place the CR2032 lithium battery into the battery holder.
2. Connect the battery holder to the Sensors Board ISP131001.
3. Start “isp sensor” application on your iOS, click Connect and select your Sensors Board.



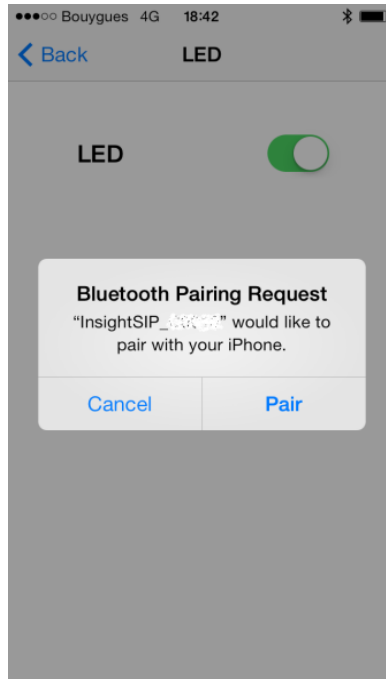
- Click Accelerometer. A Calibration phase invites you to rotate the ISP131001 Sensors Board. Then, a starship on your iPhone screen follows the Sensors board movement.



- Click Back and Temperature to start temperature and pressure demonstration.



6. Click Back and LED. A prompt will invite you to pair the Sensors Board with the iPhone. Click Pair. The LED lights up.



To switch off ISP131001 Sensors Board, remove battery.

### 6.3. On Android Device

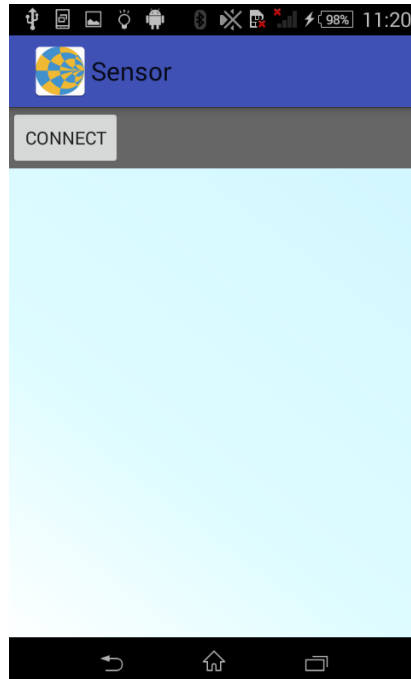
An App is also available for Android Devices. On Google Play, search “sip sensor” or “insight sip” and download the App. The android App is a demonstration App that is provided “as is” in order to demonstrate the Smart Bluetooth sensor node.

Make sure your Android device is compatible with Bluetooth 4.0 (Android v4.3 at least).

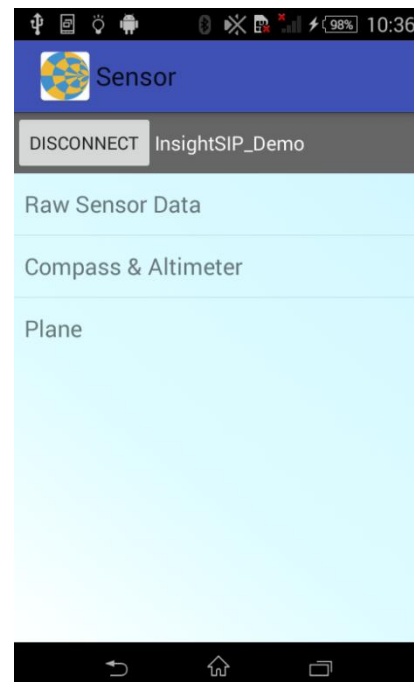
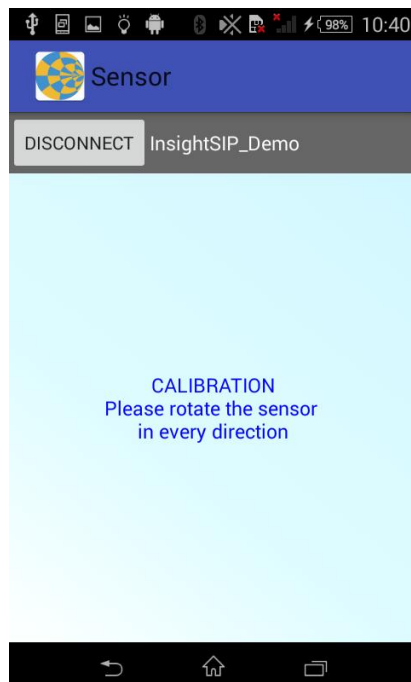
After the “sip sensor” application is downloaded and installed you should see the application on your Android device. Then you will be able to set up the application demonstration as follows:

1. (For Android v6 or earlier) In order to be able to scan for BLE devices, the application needs to have “Location” permission. You have to enable “Location” service in the settings and give permission to the Sensor App to use Location (Settings -> Application Manager -> Sensor -> Permission).
2. Place the CR2032 lithium battery into the battery holder.
3. Start “Sensor” application on your Android, click Connect and select your Sensor Board (InsightSIP\_DEMO)

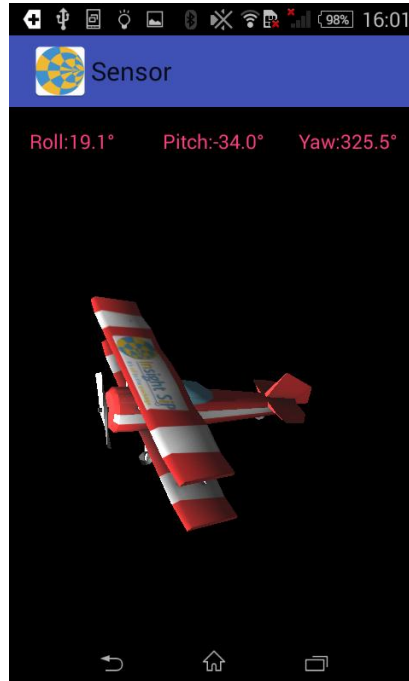




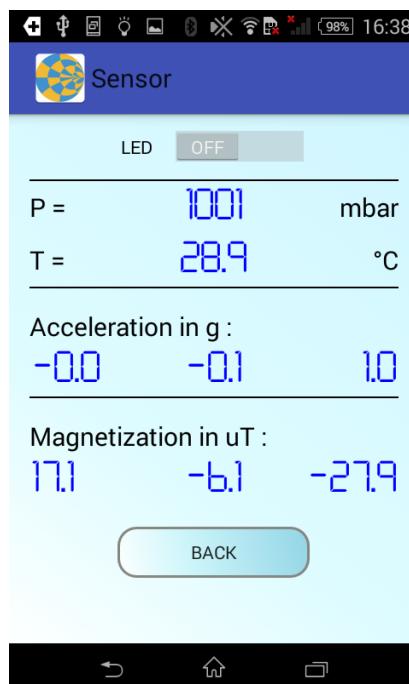
4. A Calibration phase invites you to rotate the ISP131001 Sensors Board. Then, a menu will appear.



5. Select "Plane" and a plane will appear on the screen and it will follow the board movement.



6. Press Back and Select "Raw Sensor Data" to monitor all sensor data. On this screen, LED can also be turned ON/OFF.



7. Press Back and Select “Compass & Altimeter”. The top part is the altimeter, it has to be calibrated by entering your current altitude once. The bottom part is the compass and it doesn't need to be calibrated (it has already been done in step 4).

