

Type 2NR EVK V4

User Guide - Rev. 4.0



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About This Document

Murata Type 2NR module (Murata part number LBMA0ZZ2NR-001) supports 3 wireless radios: Bluetooth® Low Energy, IEEE802.15.4 and NFC. It is based on Nordic Semiconductor's nRF54L15 SoC. This document provides the setup instructions for the Murata Type 2NR EVK V4 (LBMA0ZZ2NR-EVK).



This document is dedicated to 2NR EVK V4. The revision of the EVK is printed on the board. If you are using another version of the EVK, please refer to the corresponding documents.

Audience & Purpose

This document is intended for software/firmware, hardware, and systems engineers to evaluate and develop applications with Murata's Type 2NR module.

Document Conventions

Table 1 describes the document conventions.

Table 1: Document Conventions

Conventions	Description
	Warning Note Indicates very important note. Users are strongly recommended to review.
	Info Note Intended for informational purposes. Users should review.
	Menu Reference Indicates menu navigation instructions. Example: Insert → Tables → Quick Tables → Save Selection to Gallery 
	External Hyperlink This symbol indicates a hyperlink to an external document or website. Example: Murata  Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. Example: Introduction  Click on the text to open the link.
<code>Console input/output or code snippet</code>	Console I/O or Code Snippet This text Style denotes console input/output or a code snippet.
<code># Console I/O comment // Code snippet comment</code>	Console I/O or Code Snippet Comment This text Style denotes a console input/output or code snippet comment. - Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. - Code Snippet comment (preceded by "//") may exist in the original code.

1 Introduction

Murata Type 2NR module (Murata part number LBMA0ZZ2NR-001) supports 3 wireless radios: Bluetooth® Low Energy, IEEE802.15.4 and NFC. It is based on Nordic Semiconductor's nRF54L15 SoC. This document provides the setup instructions for the Murata Type 2NR EVK V4 (LBMA0ZZ2NR-EVK).

2 Kit Contents

The Murata Type 2NR EVK contains the following items:

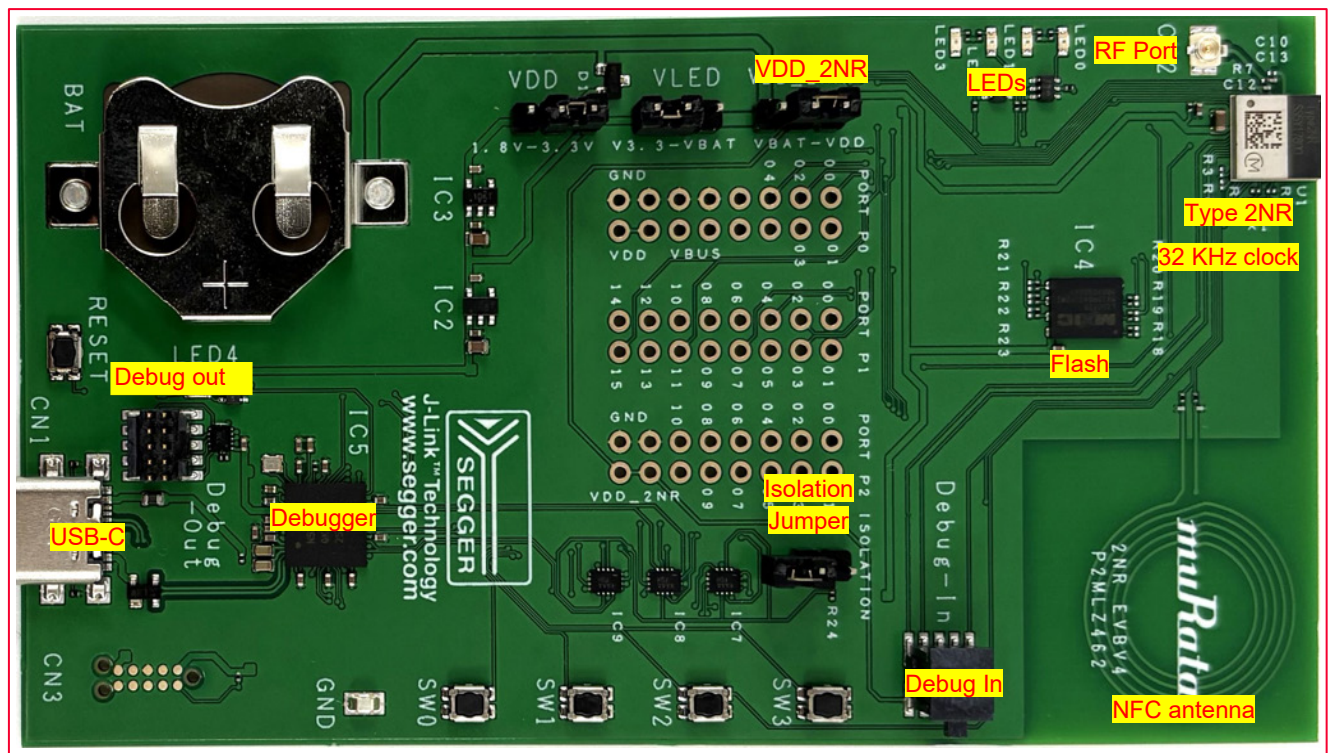
1. Type 2NR evaluation board
2. 1 USB-C cable

2.1 Type 2NR EVK

The 2NR EVK comes with an on-board debugger/programmer, so no external debugger board is required for the development of a 2NR project.

Figure 1 shows the 2NR EVK.

Figure 1: Murata Type 2NR EVK



The various components are described in **Table 2** below.

Table 2: Murata Type 2NR EVK Components

Label	Description
LED0	This LED is used in the blinky LED demo application.
USB-C (CN1)	Power and UART0/UART1. Connect a USB cable to the host PC.
RF port (CN2)	External U.FL antenna can be connected here for Bluetooth/802.15.4 antenna. This antenna is disabled by default. See Section 9.3 for instructions on enabling this.
NFC Antenna	This antenna is by default enabled.
Type 2NR	Type 2NR module
VDD	This jumper is used to set up the EVK to use either 3.3 V or 1.8 V. - Left: 1.8 V - Right: 3.3 V
VLED	This jumper is used to select USB power or battery power for LEDs. - Left: USB - Right: Battery
VDD_2NR	This jumper is used to select USB power or battery power for EVK. - Left: Battery - Right: USB
LEDs	LED0 ~ LED3 for applications. LED4 for debugger use.
32 KHz clock (X1)	External 32 KHz slow clock
Flash (IC4)	Macronix MX25R6435F 8 MB flash (optional)
Isolation Jumper	This jumper is used during battery operation and current measurement only.
Debug in	If there is an issue with the on-board debugger, use this port to connect to an external debugger such as a nRF54L15 DK board or another 2NR EVK.
Debug out	It is used to debug or flash another 2NR EVK.
RESET button	Resetting the 2NR.



This EVK revision supports battery operation. In battery operation place isolation jumper to disconnect from nRF5340.

3 Hardware Setup

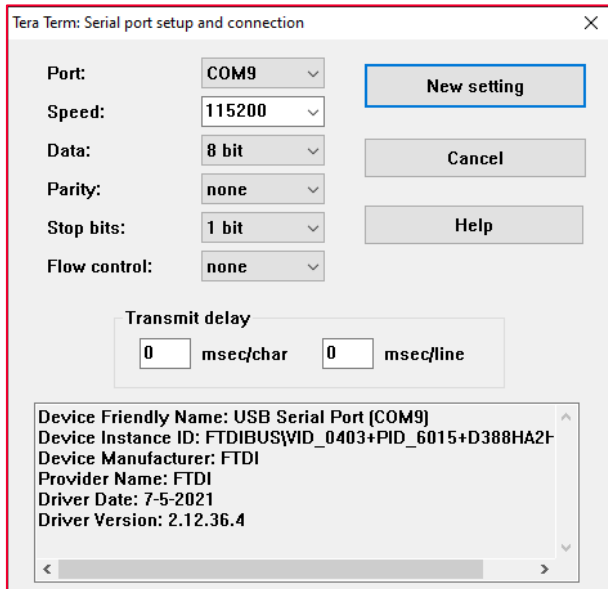
3.1 Type 2NR EVK Setup

Connect the Type 2NR EVK to the host PC using USB-C cable.

Open device manager on the host PC and check the detected COM port enumeration. There should be two COM ports, shown as 'JLink CDC UART port'. Typically, the lower-numbered COM port can be used to interact with the application on Type 2NR.

Open a terminal application ([PuTTY](#) , [Tera Term](#) ) and configure the serial port for 115200 baud, 8 data bits, no parity, and 1 stop bit (8N1), as shown in **Figure 2**.

Figure 2: Serial Port Setup



4 Default Application

The board should have already flashed with a default application: blinky app, which just blinks on LED 0. The blinky app can be found from SDK examples (see [Section 7.2.1](#) )

5 2NR Software Setup

To build applications, read this section to set up software development environment.



Some of the software components may require Administrator privilege to install.

5.1 Install SDK

Check out [Nordic's tutorial video](#) .

Download and install the following: (mostly covered in the video linked above)

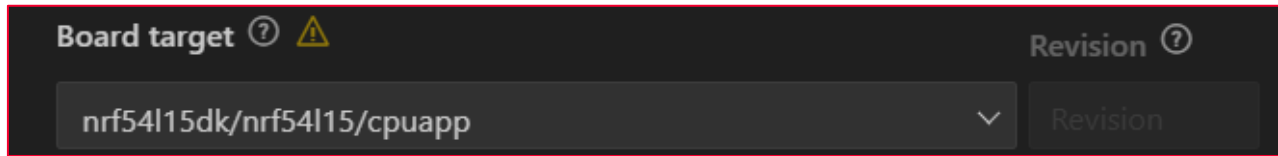
- [nRF Connect for Desktop](#) 
- [nRF Util](#)  (not covered by the video but necessary to install)
- [Visual Studio Code](#)  (VSC)
- nRF Connect Extension Pack (for VSC) and SDK

After VSC is installed, install the nRF Connect extension pack and the latest toolchain (such as 3.1.0). Then install the nRF Connect SDK version such as 3.1.0.

6 SDK Patch for 2NR

The 2NR is basically the same as nrf54l15dk/nrf54l15/cpuapp at the build Configuration window.

Figure 3: Board Target Type



There is one SDK configuration that must be modified in order for the high frequency crystal clock to be more accurate. The crystal is inside the module, and there are two capacitors controlled by software that need a different value than the default SDK value. Follow the process described below.

Navigate to the SDK folder, such as C:\ncs\3.1.0. Open
C:\ncs\v3.1.0\zephyr\boards\nordic\nrf54l15dk\nrf54l_05_10_15_cpuapp_common.dtsi.

Find the following:

```
&hfxo {
    load-capacitors = "internal";
    load-capacitance-femtofarad = <15000>;
};
```

Change the value from 15000 to 10500, so that it becomes:

```
&hfxo {
    load-capacitors = "internal";
    load-capacitance-femtofarad = <10500>;
};
```



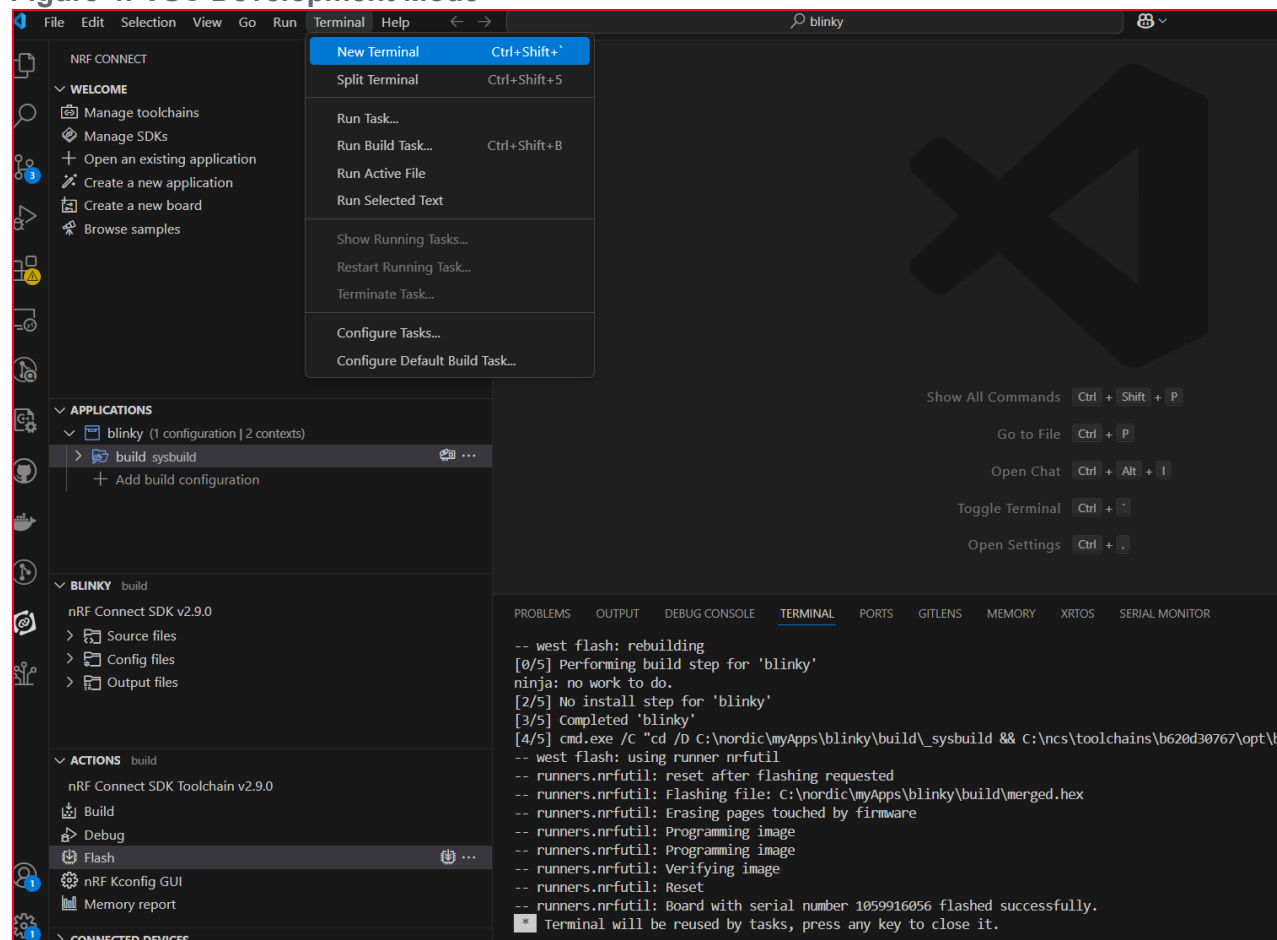
This has to be done for every SDK update later on, or in the overlay file
boards\nrf54l15dk_nrf54l15_cpuapp.overlay.

7 Building Applications

7.1 VSC Environment

Open a terminal window to monitor building and flashing progress.

Figure 4: VSC Development Mode



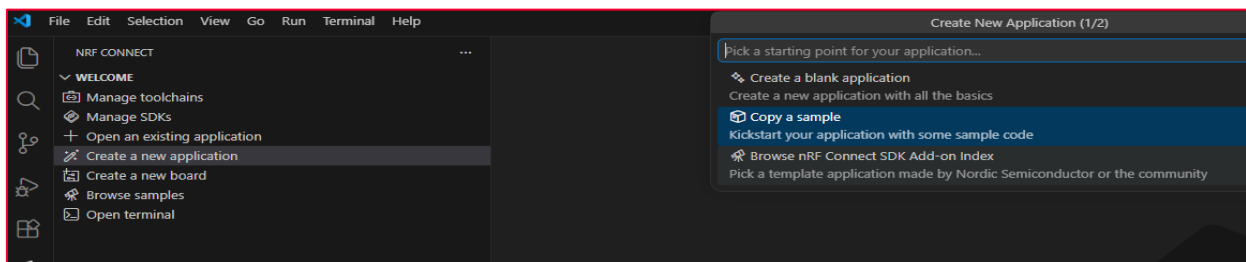
7.2 Implementing an Application (BLE)

7.2.1 Creating an App

You can create a brand-new app or copy existing examples.

There are many examples in SDK. Following is the BLE peripheral_hr example.

Figure 5: Copy a Sample



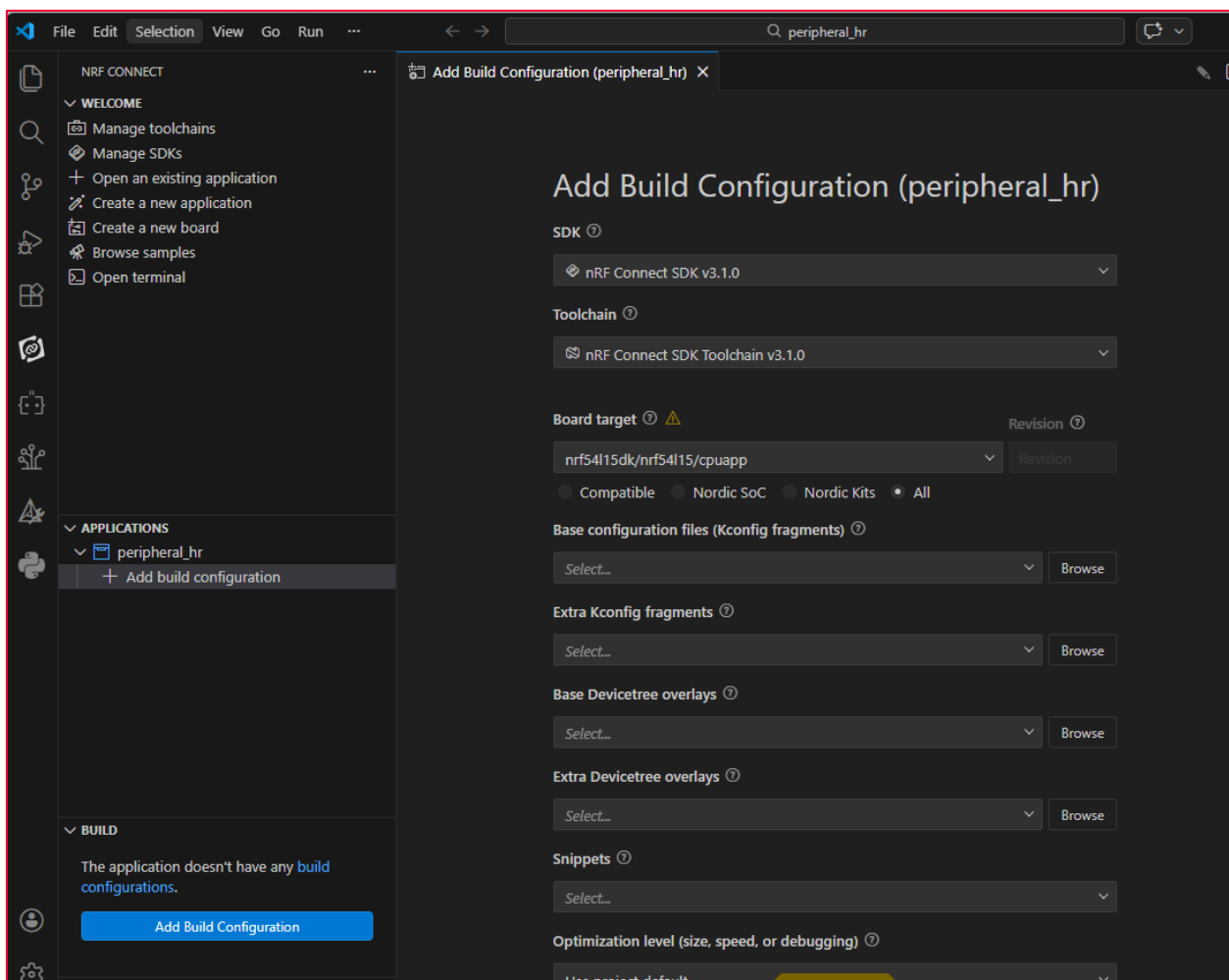
Click “Create a new application” → “Copy a sample”. Select the SDK version (e.g., 3.1.0). Then type the name in the search bar, e.g. “peripheral_hr”.

After confirming the folder location, the “peripheral_hr” app will appear in the “Applications” in the left pane.

7.2.2 Configuration and Building

Click the Add build configuration and type in “nrf54l15” in the “Board target” box. If you do not see the “nrf54l15dk/nrf54l15/cpuapp”, that means the example does not have support for the 2NR board. Only when you are able to select “nrf54l15dk/nrf54l15/cpuapp”, the application is supported on the 2NR EVK.

Figure 6: Build Configuration



Click on “Generate and build” button, it will start to generate the build script and build the binary. After the build, C:/nordic/myApps/peripheral_hr/build/peripheral_hr/zephyr/zephyr.hex will be generated.

7.2.3 Customizing a Build

7.2.3.1 prj.conf

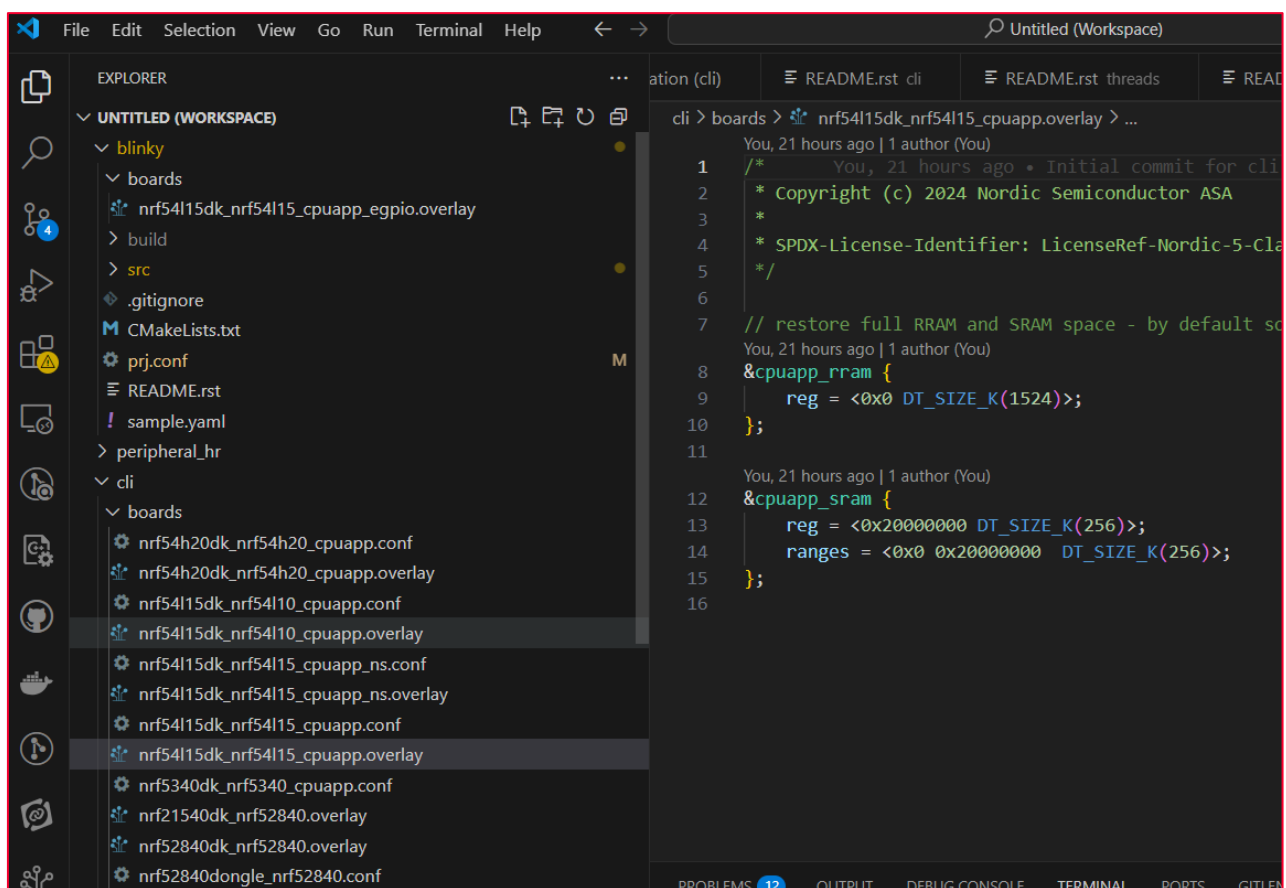
There is a prj.conf file under each app's folder. Add any config parameters there to customize the building. For example, if your board does not have the 32 KHz crystal, then modify the prj.conf to add below lines to enable the use of internal 32 KHz clock. Then make a pristine build.

```
CONFIG_CLOCK_CONTROL_NRF_K32SRC_RC=y
CONFIG_CLOCK_CONTROL_NRF_K32SRC_XTAL=n
```

7.2.3.2 Overlay

There are also overlay files that you can add your configuration parameters in.

Figure 7: Overlay Files



For example, the default regulator configuration is DCDC mode. If you want to change to LDO mode, you can append below to the nrf54l15dk_nrf54l15_cpuapp.overlay.

```
&vregmain {
    status = "okay";
    regulator-initial-mode = <NRF5X_REG_MODE_LDO>;
};
```

SDK patch can be in overlay file.

```
&hfxo {
    load-capacitors = "internal";
    load-capacitance-femtofarad = <10500>;
};
```

7.2.4 Flashing the Binary



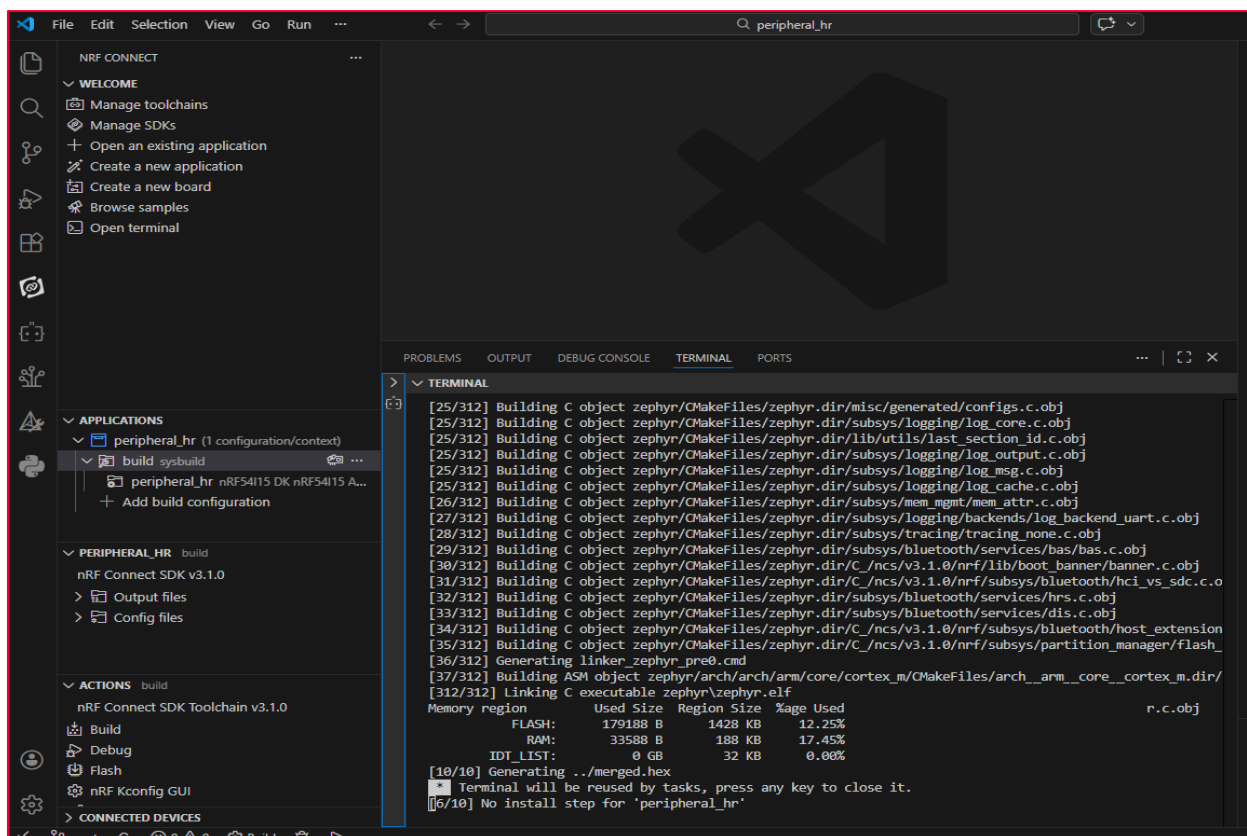
Please Note Murata recommends using nRF Connect to flash the EVK, covered in [Section 7.2.4.2](#).

7.2.4.1 Using VSC

Plug in the USB-C cable to connect the 2NR EVK to the computer.

With “Build sysbuild” under the app highlighted, click on “Flash”.

Figure 8: Flashing via VSC

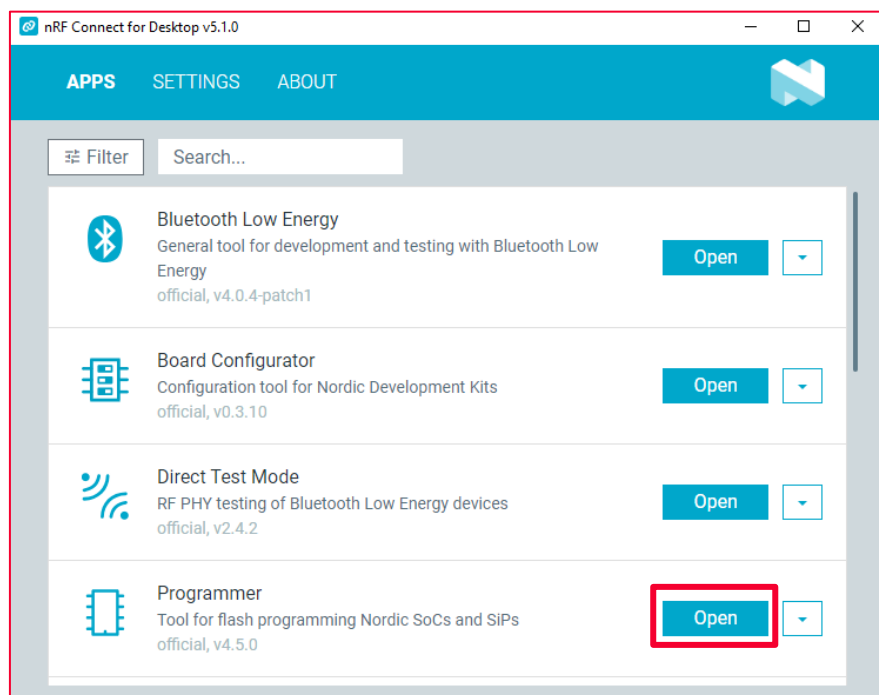


7.2.4.2 Using nRF Connect for Desktop

There is another way to flash the binary using nRF Connect for Desktop. This is useful when a prebuilt HEX file is provided and you just want to flash it onto a board.

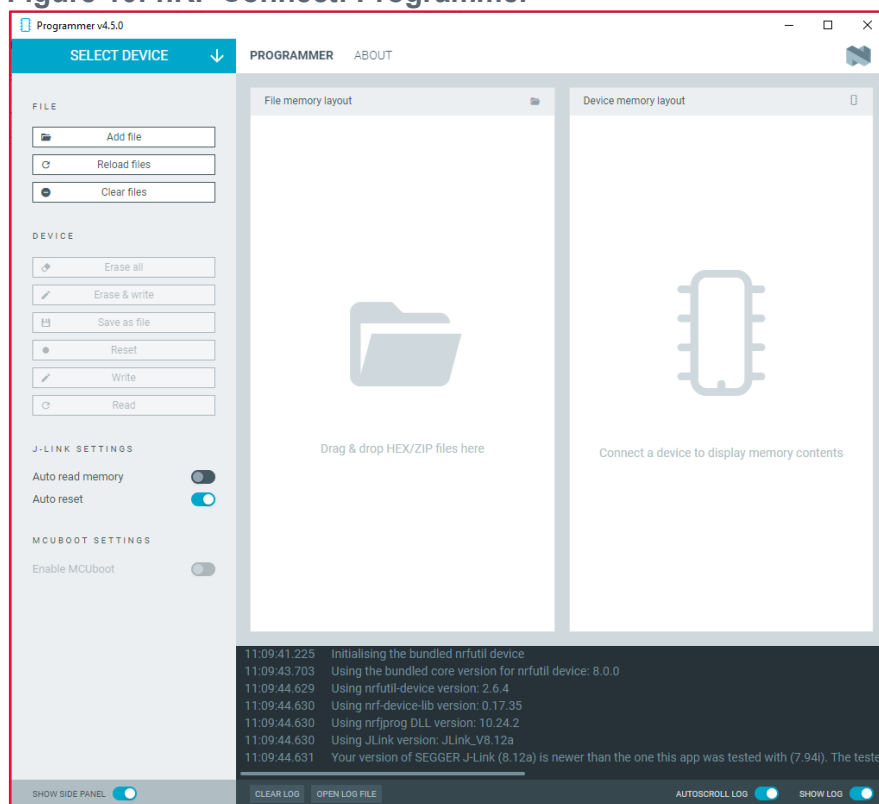
Open nRF Connect for Desktop. Then click on Open button for “Programmer”.

Figure 9: Flashing via nRF Connect



The window will open as shown in **Figure 10**.

Figure 10: nRF Connect: Programmer



Plug in the USB cable to connect device to the PC and click on “SELECT DEVICE”, select the JLINK device.

Click “Add file” and select the hex file. Then click “Erase & write” to flash the hex file.

If there is already a file in the tool, click “Clear files” first before adding a new file.

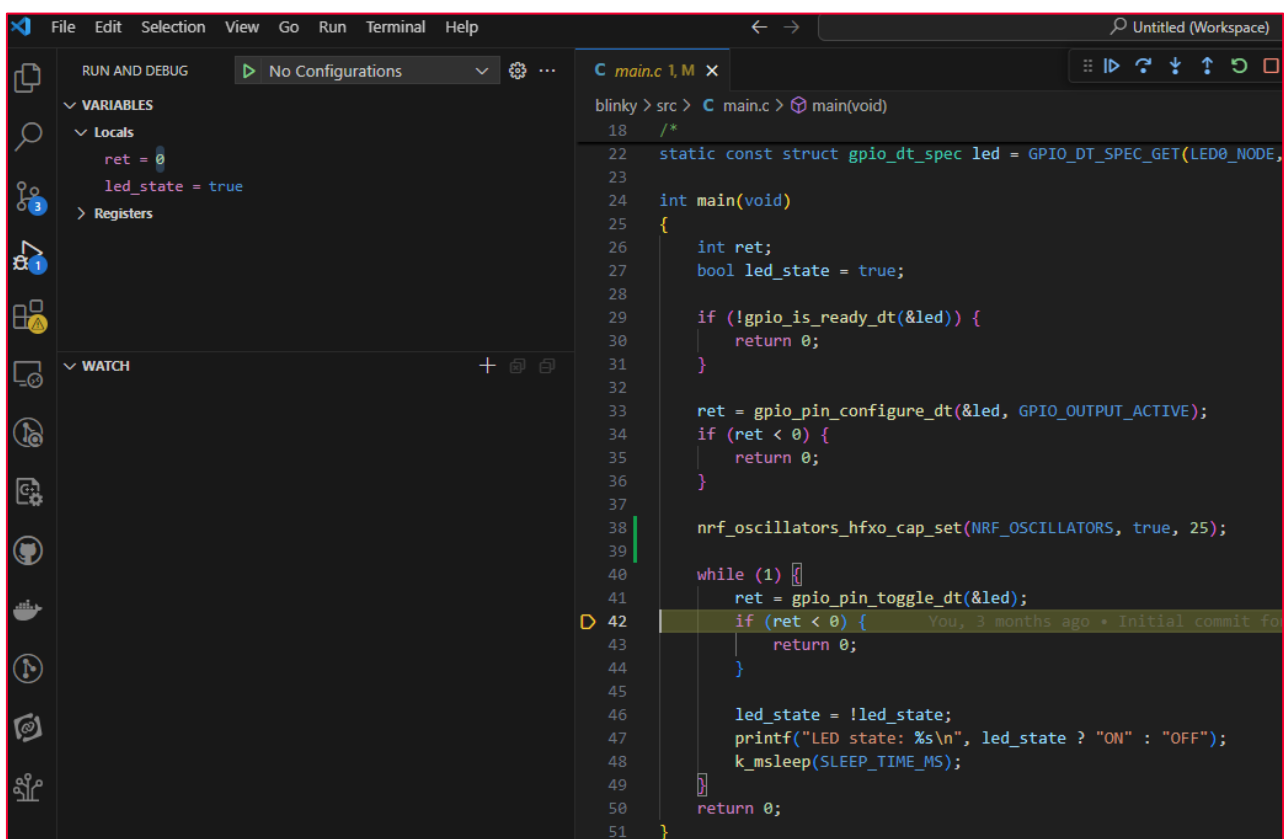
7.2.5 Debugging

7.2.5.1 Using the Onboard Debugger

For debugging, in the Build Configuration -> Optimization Level, select “Optimize for Debugging - Og” and rebuild it.

To debug the app, with “Build sysbuild” under the app highlighted, click on “Debug”. VSC will build and flash the binary into the module and start debug session.

Figure 11: Debugging



Use the buttons in the top right corner in the above picture to Continue, Step over, Step in, step out, Restart, and Stop debugging.

7.2.5.2 Debugging 2NR on a Different Board

You can debug or flash 2NR on another EVK by connecting a SWD cable from the “Debug out” port to another EVK’s “Debug in” port. Follow the same steps as in [Section 7.2.5.1](#)

8 Feature Testing

8.1 Testing Bluetooth

After flashing the Bluetooth app (peripheral_hr), it will start automatically. LED0 will be blinking, waiting for a peer to connect. Use a serial port emulator such as Tera Term to monitor the app. Configure Tera Term as below and open one of the COM ports shown in Device Manager.

Figure 12: Tera Term Settings

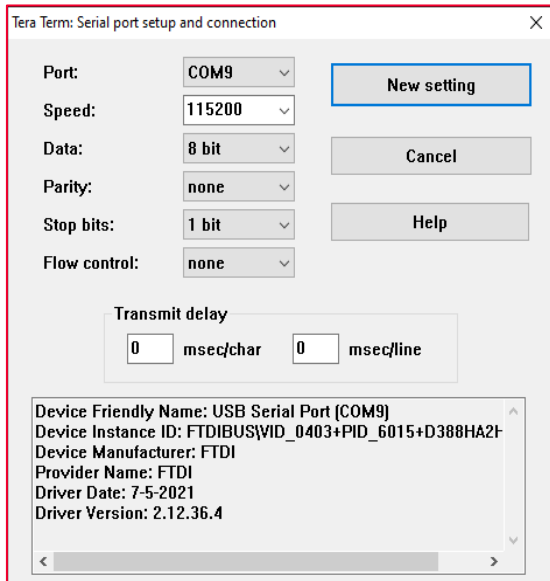
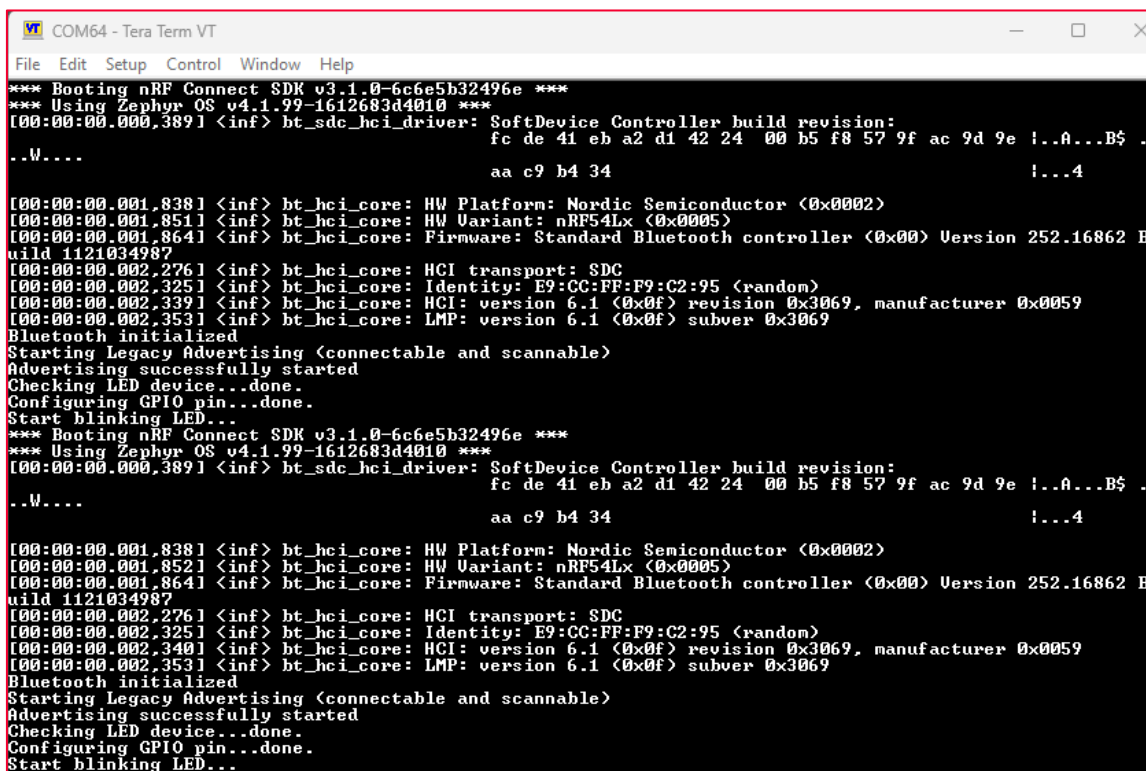
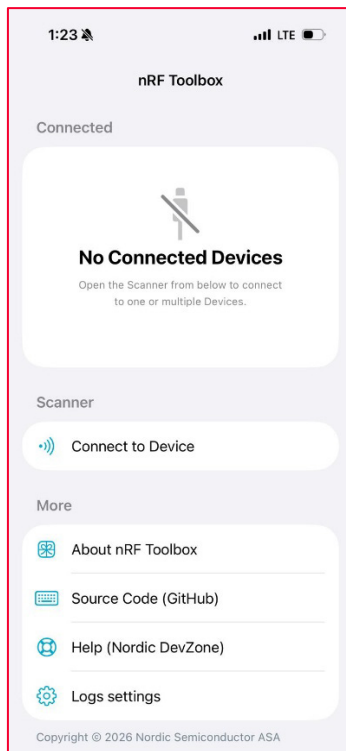


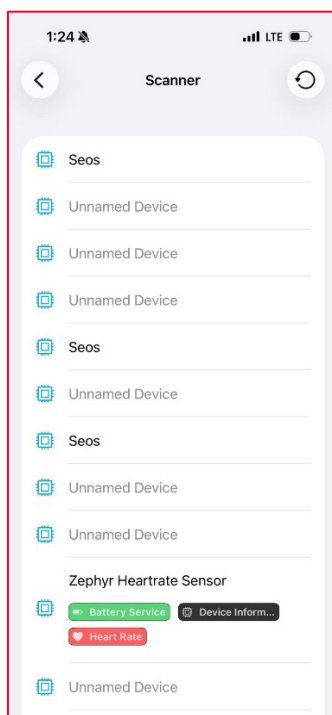
Figure 13: Tera Term Logs



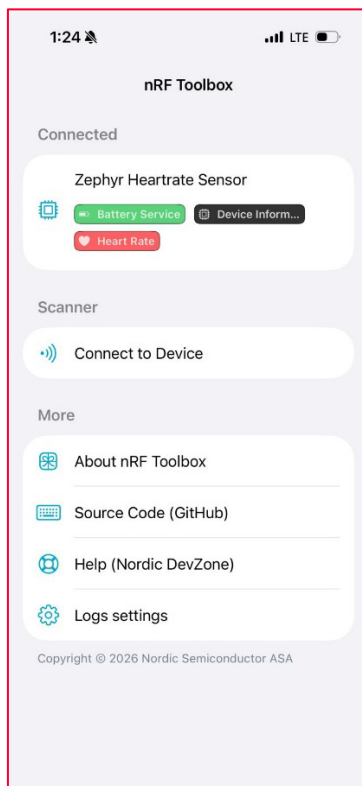
- Install the “nRF Toolbox” from App Store on your phone. Click on “Connect to Device” as shown in **Figure 14**”.

Figure 14: Phone App: nRF Toolbox

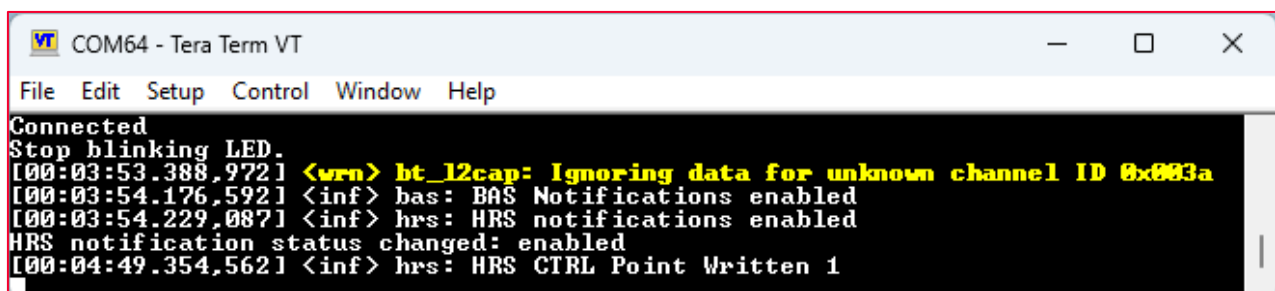
- Select the device “Zephyr Heartrate Sensor” as shown in **Figure 15**.

Figure 15: Scan for a Device

- Click on the “Heart Rate” as shown in **Figure 16**.

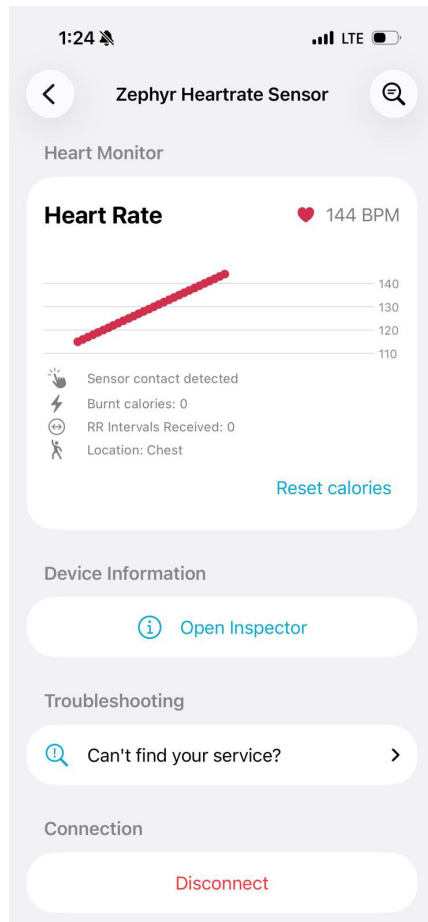
Figure 16: Connect to the Device

- Tera Term will show messages about BLE connection in **Figure 17**.

Figure 17: Serial Port Output

- BLE data will be shown in **Figure 18**.

Figure 18: Displaying Heart Rate Data

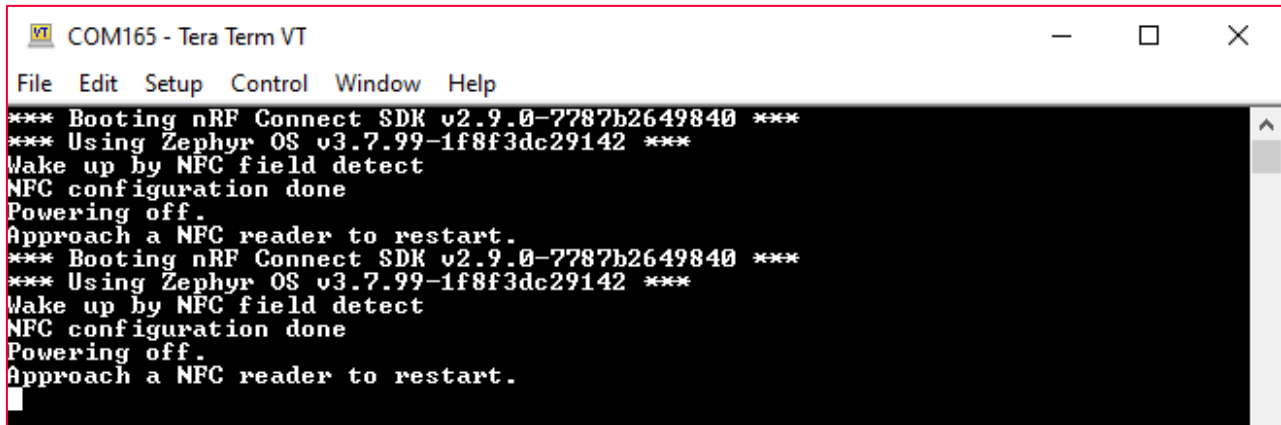


8.2 Testing NFC

There are NFC examples in the SDK. For example, build the “System off” example and flash it. Read the README.rst to understand how to build and run the sample.

LED0 should be off by default, use an NFC reader (iPhone’s upper edge) to get close to the coil NFC antenna, LED0 should turn on, and the terminal will show below information.

Figure 19: NFC App “System Off” Serial Port Output



```

VT COM165 - Tera Term VT
File Edit Setup Control Window Help
*** Booting nRF Connect SDK v2.9.0-7787b2649840 ***
*** Using Zephyr OS v3.7.99-1f8f3dc29142 ***
Wake up by NFC field detect
NFC configuration done
Powering off.
Approach a NFC reader to restart.
*** Booting nRF Connect SDK v2.9.0-7787b2649840 ***
*** Using Zephyr OS v3.7.99-1f8f3dc29142 ***
Wake up by NFC field detect
NFC configuration done
Powering off.
Approach a NFC reader to restart.

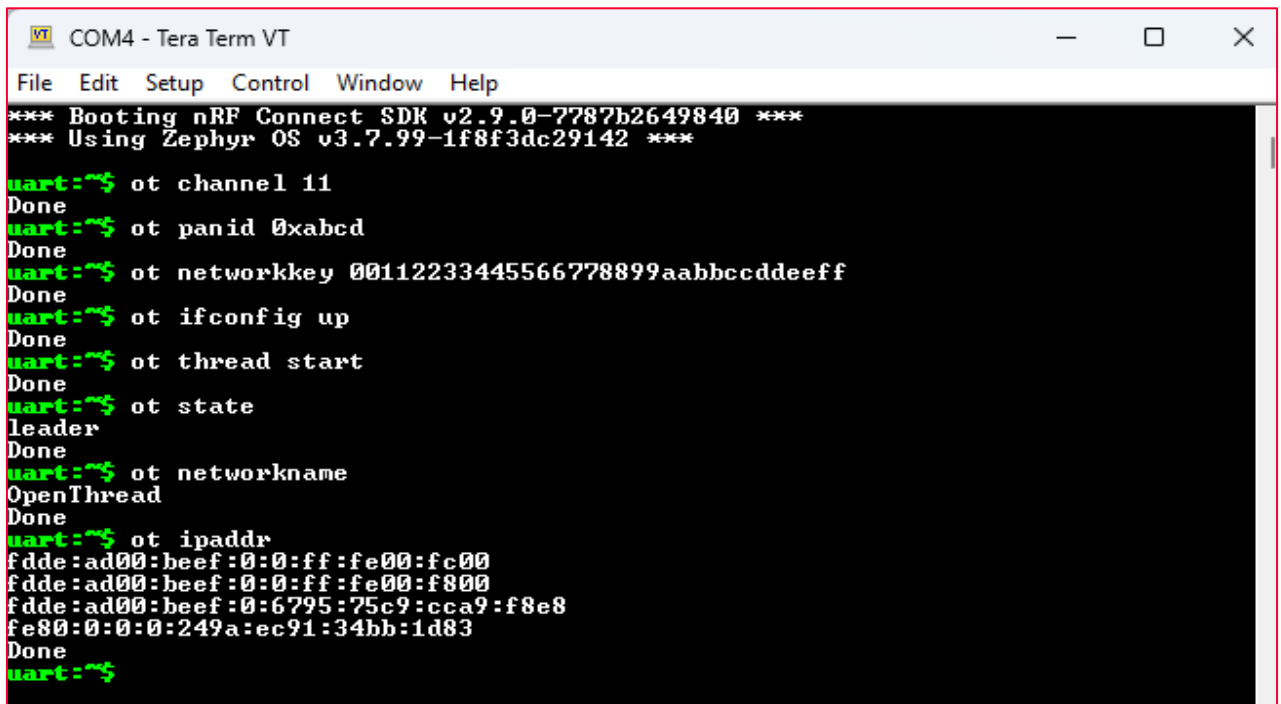
```

8.3 Testing 802.15.4

Create an application by copying the “Thread CLI Sample” [Thread CLI Sample](#). Read the README.rst to understand how to build and run the sample.

The CLI can be used for certification tests. Flash the application to two EVKs to test connection between the two.

Figure 20: Thread: CLI Sample Serial Port Output EVK 1



```

VT COM4 - Tera Term VT
File Edit Setup Control Window Help
*** Booting nRF Connect SDK v2.9.0-7787b2649840 ***
*** Using Zephyr OS v3.7.99-1f8f3dc29142 ***
uart:~$ ot channel 11
Done
uart:~$ ot panid 0xabcd
Done
uart:~$ ot networkkey 00112233445566778899aabbccddeeff
Done
uart:~$ ot ifconfig up
Done
uart:~$ ot thread start
Done
uart:~$ ot state
leader
Done
uart:~$ ot networkname
OpenThread
Done
uart:~$ ot ipaddr
fdde:ad00:beef:0:0:ff:fe00:fc00
fdde:ad00:beef:0:0:ff:fe00:f800
fdde:ad00:beef:0:6795:75c9:cca9:f8e8
fe80:0:0:0:249a:ec91:34bb:1d83
Done
uart:~$

```

Figure 21: Thread: CLI Sample Serial Port Output EVK 2

```
> Type and press Enter to send Send

*** Booting nRF Connect SDK v2.9.0-7787b2649840 ***
*** Using Zephyr OS v3.7.99-1f8f3dc29142 ***

uart:~$ ot> ot channel 11
channel 11
Done
uart:~$ ot> ot panid 0xabcd
panid 0xabcd
Done
uart:~$ > ot networkkey 00112233445566778899aabbccddeeff
ot networkkey 00112233445566778899aabbccddeeff
Done
uart:~$ ot> ot ifconfig up
ifconfig up
Done
uart:~$ > ot thread start
ot thread start
Done
uart:~$ ot > ot ping fdde:ad00:beef:0:6795:75c9:cca9:f8e8
ping fdde:ad00:beef:0:6795:75c9:cca9:f8e8
16 bytes from fdde:ad00:beef:0:6795:75c9:cca9:f8e8: icmp_seq=1 hlim=64 t
ime=27ms
1 packets transmitted, 1 packets received. Packet loss = 0.0%. Round-tri
p min/avg/max = 27/27.0/27 ms.
Done
uart:~$ 
```

CLEAR CONSOLE

9 RF Testing

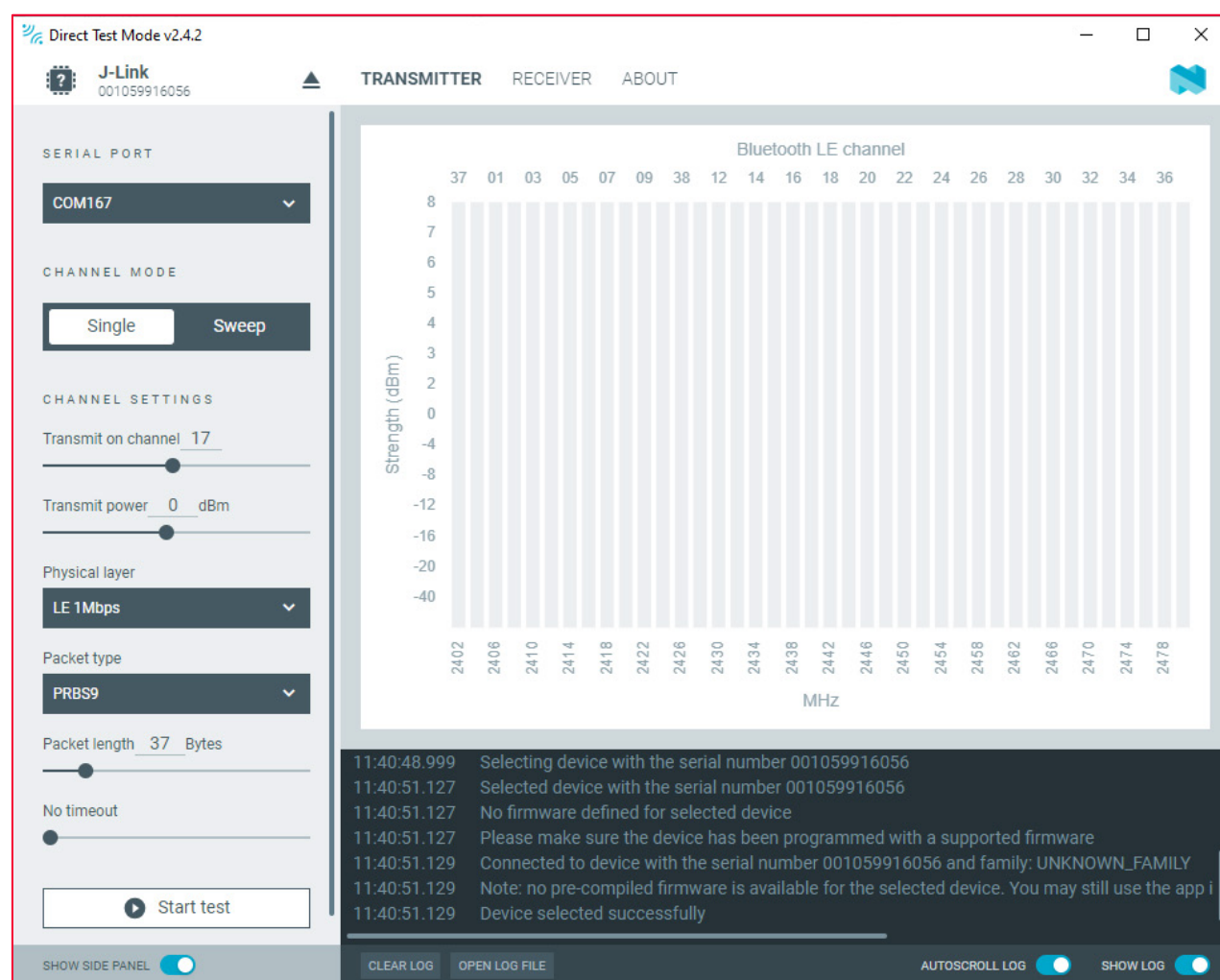
9.1 Direct Test Mode (DTM)

There is a Direct Test Mode example in SDK. Select and build the DTM example in a way similar to the BLE example.

The DTM application should work with any automatic BLE testers via UART. There is also a function in the nRF Connect for Desktop PC application that user can run manually to do some RF tests.

Click “Open” button for function “Direct Test Mode” from nRF Connect for Desktop.

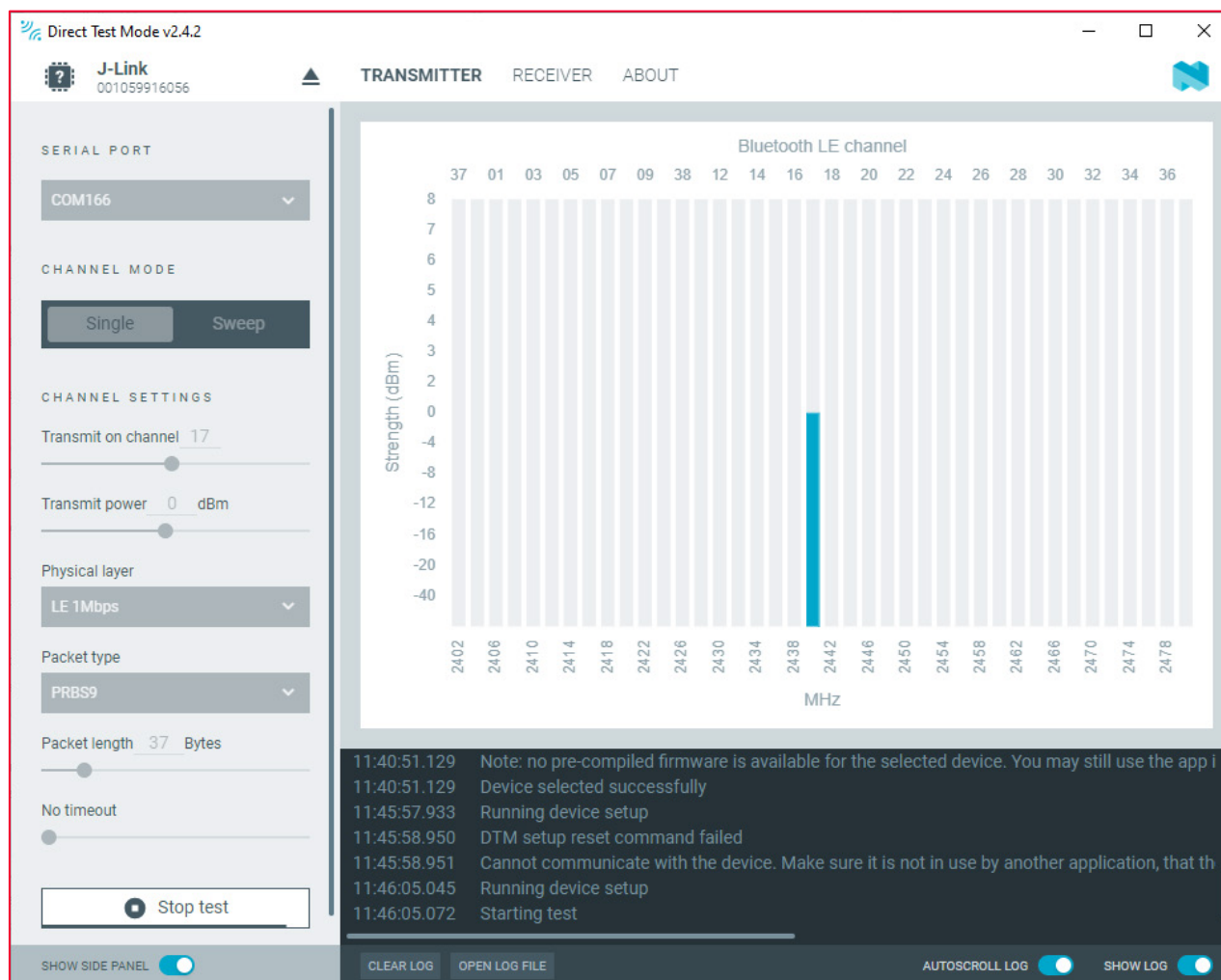
Figure 22: nRF Connect: DTM



There will be two COM ports showing under “SERIAL PORT”. Select the lower-numbered COM port first. Click on “Start test”. If a blue bar shows up, communication has been established successfully. You can change different parameters on the screen for different tests.

If it fails, it is possible the port number is not correct. Select the other port number and try again.

Figure 23: nRF Connect: DTM Transmission



9.2 Radio Test

Apart from the DTM app, there is another sample app “radio_test”. It covers testing of BLE, 802.15.4 and Nordic proprietary radio. Read the README.rst to understand how to build and run the sample.

It allows users to test RF performance from a shell via serial port instead of a PC tool.

9.3 Conducted RF Test Hardware Modifications

To use the u.FL connector, add a 0 Ω resistor R7, and remove C12 and L1.

10 Current Measurement

Remove jumper on VDD_2NR and connect the current meter across the two right-most pins if using USB power.

11 References

11.1 Type 2NR EVK Schematic

Contact Murata Sales.

11.2 Type 2NR Datasheet

Contact Murata Sales.

12 Acronyms

The following table describes the acronyms used in this document.

Table 3: Acronyms

Acronym	Description
802.15.4	IEEE 802.15.4 is a technical standard which defines the operation of a low-rate wireless personal area network (LR-WPAN), maintained by the IEEE 802.15 working group  .
ARM	Advanced RISC Machines.
BLE	Bluetooth Low Energy. It is a wireless personal area network technology designed and marketed by the Bluetooth Special Interest Group  .
NFC	Near Field Communication
DC	Direct Current
EVK	Evaluation Kit. The Type 2NR EVK contains the Type 2NR evaluation board, cables.
GPIO	General Purpose Input/Output.
IDE	Integrated Development Environment. It is a software application that provides comprehensive facilities for software development such as a source-code editor, build automation tools, and a debugger.
IO	Input Output
LED	Light Emitting Diode. It is a semiconductor device that emits light when current flows through it. The Type 2NR evaluation board contains multiple LEDs for various indications.
PCB	Printed Circuit Board.
RF	Radio Frequency.
SDK	Software Development Kit. It is a collection of software development tools in one installable package.
SWD	Serial Wire Debug. SWD is a modification/implementation of JTAG specifically for ARM processors.
u.FL	u.FL is a miniature RF connector for high-frequency signals up to 6 GHz.
UART	Universal Asynchronous Receiver-Transmitter. It is an industry standard device-to-device communication protocol.

Revision History

Revision	Date	Author	Change Description
1.0	April 21, 2025	TCF	Initial Release
2.0	Nov 12, 2025	TCF	EVK V2 updates: Add debug out pin and isolation switches, noted that battery operation and current measurement are not supported.
3.0	March 2, 2026	TCF	EVK V3 updates: Isolation jumper is functional. Battery operation and current measurements are supported.
4.0	May 26, 2026	TCF	EVK V4 updates.



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