

RF-DG-40A Bluetooth 5.0 Low Energy nRF52840 USB Dongle User Guide

Version 1.2

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1 Device Overview

1.1 Description

The nRF52840 Dongle is a small, low-cost USB dongle that supports Bluetooth[®] Low Energy 5, Bluetooth mesh, Thread, ZigBee, 802.15.4, ANT and 2.4 GHz proprietary protocols. The Dongle is the perfect target hardware for use with nRF Connect for Desktop as it is low-cost but still supports all the short-range wireless standards used with Nordic devices. The dongle has been designed to be used as a wireless HW device together with nRF Connect for Desktop as well as programming through nRFUtil. For other use cases please do note that there is no debug support on the Dongle, only support for programming the device and communicating through USB.

It can also be used to develop code for the nRF52840 SoC mounted on the dongle. Programming is supported through a USB-enabled bootloader. Connectors for external debuggers are available.

It is supported by most of the nRF Connect for Desktop APPs and will automatically be programmed if needed. In addition, custom applications can be compiled and downloaded to the Dongle. It has a user-programmable RGB LED, a green LED, a user-programmable button as well as 15 GPIO accessible from castellated solder points along the edge. Example applications are available in the nRF5 SDK under the board name PCA10059.

1.2 Key Features

- Bluetooth 5 ready multiprotocol radio
 - 2 Mbps
 - Long Range
 - Advertising Extensions
 - Channel Selection Algorithm #2 (CSA #2)
- IEEE 802.15.4 radio support
 - Thread
 - ZigBee
- ARM[®] CortexTM-M4 with floating point support

1.3 Application

- Advanced wearables
 - Advanced personal fitness devices
 - Connected health
- loT
 - Connected home sensors and controllers

- 15 GPIO available via edge castellation
- USB interface direct to nRF52840 SoC
- Integrated 2.4 GHz PCB antenna
- 1 user-programmable button
- 1 user-programmable RGB LED
- 1 user-programmable LED
- 1.7 V ~ 5.5 V operation from USB or external
- NFC available
 - Industrial IoT sensors and controllers
- Interactive entertainment devices
 - Advanced remote controls
 - Gaming controllers
 - Virtual/Augmented Reality applications



2 Hardware Description

The nRF52840 Dongle can be used as a development platform for the nRF52840 SoC. It features user-configurable LEDs, a button and an NFC connector as well as 15 GPIOs available along the board edges. In addition to radio communication, the nRF52840 SoC can communicate with a computer through USB.

2.1 Hardware Drawings

The nRF52840 Dongle hardware drawings show both sides of the RF-DG-40A board.



Figure 1. RF-DG-40A Dongle (Front)





Figure 2. RF-DG-40A Dongle (Back)

The PCB footprint is as follows:



Figure 3. RF-DG-40A PCB Footprint



2.2 Block Diagram



The block diagram illustrates the nRF52840 Dongle functional architecture.

2.3 SWD Interface

On the backside of the nRF52840 Dongle, there are connection points for the SWD interface.

The dongle is equipped with a footprint for two different connectors. On footprint P1, a standard 2×5-pin pin header with

a 1.27 mm pitch can be soldered. On footprint J2, it is possible to connect a TC2050 cable from Tag-Connect.







For instance, a Nordic development kit can be used as a programmer for the Dongle.

2.4 Buttons and LEDs

The nRF528540 Dongle is equipped with a green LED (LD1), a multicolor RGB LED (LD2), a user-configurable button

(SW1), and a reset button (SW2).

The LEDs and buttons are connected to dedicated I/Os on the nRF52840 SoC.



Figure 6. nRF52840 Dongle Buttons and LEDs

Part	Description	GPIO
SW1	Button	P1.06
SW2	Reset	P0.18
LD1	Green	P0.06
LD2	Red	P0.08
LD2	Green	P1.09
LD2	Blue	P0.12

The buttons are active low, which means that the input will be connected to the ground when the button is activated. The SW1 button has no external pull-up resistor, but the reset button (SW2) has a 10 k pull-up resistor. To use SW1, P1.06 must be configured as an input with an internal pull-up resistor.

The LEDs are active low, which means that writing a logical zero '0' to the output pin will illuminate the LED.



2.5 USB



The nRF52840 Dongle features a USB-A-type connector printed on the circuit board.

Figure 7. USB Port

2.6 External Connections

The nRF52840 Dongle has 15 GPIOs in addition to the ground, power, and SWD connections along the castellated edges.

The castellated edge holes have a pitch of 0.1 inches (2.54 mm) and a row spacing of 0.6 inches (15.24 mm)², making it suitable for stripboard connection. Test points for additional nine GPIOs are available on the backside of the circuit board, leaving a total of 24 GPIOs accessible.

Note: There is no reverse voltage protection on the power connections.

The SWD connections are located 0.2 inches (5.08 mm) away from the GPIOs with a row spacing of 0.4 inches (10.16 mm)



3 nRF Connect for Desktop (PC Tool)

3.1 Minimum Requirements

Before you start, check that you have the required hardware and software.

Hardware requirements

- PC with a standard type-A USB port
- RF-DG-40A

Software requirements

• nRF Connect for Desktop

Download address:

https://www.nordicsemi.com/Software-and-tools/Development-Tools/nRF-Connect-for-desktop/Download#infotabs

• Operating system: macOS, Linux, or Windows 7 or later

3.2 Build a Connection

Connect the Dongle RF-DG-40A to a computer and get started with nRF Connect for Desktop.

- 1. Download and install nRF Connect for Desktop.
- 2. Insert the nRF52840 Dongle into a USB port on your computer.
- 3. Open nRF Connect for Desktop, and choose Bluetooth Low Energy. If there is no Open choice, you need to install, see as follows. If there is Open, just click.



4. After installation, wait a moment, and click Download and Install as follows:



Bluetooth Low Energy Application Installation
The Bluetooth Low Energy application has been converted to a standalone application for compatibility reasons. It may however still be opened from nRF Connect for Desktop.
Click the button below to install the application at the following path:
C:\Users\HaoM\AppData\Local\Programs\nrfconnect-bluetooth-low-energy
File size: ~102MB
The standalone application may be uninstalled from the Windows Control Panel.
Download and Install

5. Press the RST button on RF-DG-40A to enter DFU mode, click Selcet Device, and choose the Open DFU Bootloader.

👌 nRF (Connect for Desktop Blueto	oth Low	Energy Standa	alone v4.0.0						_		×
	SELECT DEVICE	\uparrow	CONNECT	ION MAP	SERVER SETUP	ABOUT						
	Open DFU Bootloader DC26EB77AA26		2									
			11:56:39.818 11:56:39.819 11:56:39.819 11:56:39.819	 B Using nr 9 Using nr 9 Using nr 9 Using JL 	f-device-lib-js versic f-device-lib version: fjprog DLL version: .ink version: JLink_\	on: 0.4.4 0.10.3 10.15.1 /7.66a						
			11:56:39.85 11:56:39.88(or: Failed to fetch. Fa	alling back to not match th	stored data e provided versio	ın (V7.58b				
			CLEAR LOG	OPEN LOG FILE					AUTOSCROLL LOG) SHC	W LOG



6. After choose Open DFU Bootloader, there is a window shows as follows. Click Yes, the dongle will enter autoprogramming, just wait.

ଃ nRF (Connect for Desktop Bluetoot	th Low	Energy Standalone v4.0.0				-		×
	Open DFU Bootloader	A	CONNECTION MAP	SERVER SETUP	ABOUT				
Disc	Confirm							×	
> Opt	Device must be programm	ned, do	you want to proceed?						
						Yes	N	0	

7. After the installation is finished, the following window shows up. Then you are successful of the above step. If

not, pls repeat the steps from No. 5.

ଃ nRF Connect for Desktop Bluetooth Lo	w Energy Standalone v4.0.0 - 🗆 🗙
nRF52 Connectivity DC26EB77AA26	CONNECTION MAP SERVER SETUP ABOUT
Discovered devices	RF5x DC26:EB:775A-26 Generic Access Generic Attribute
	12:28:13.147 All dfu images have been written to the target device 12:28:21.302 Device setup completed 12:28:21.303 Connectivity firmware version: ble-connectivity 4.1.4+Mar-11-2021-08-36-04. SoftDevice API version: 12:28:21.307 Opening adapter connected to COM9 12:28:22.332 Successfully opened COM9. Baud rate: 1000000. Flow control: none. Parity: none. 12:28:22.337 Reset performed on adapter COM9 12:28:23.452 Adapter connected to COM9 opened
SHOW SIDE PANEL	CLEAR LOG OPEN LOG FILE OPEN LOG FILE SHOW LOG



If you would like to choose the other programmers, such as Direct Test Mode. The installation steps are the same, follow the instruction from step 1~7.

Ø r	nRF Connect fo	or Desktop v3.12.0	—		\times
	APPS	SETTINGS ABOUT			
[≇ Filter	Search	Update all	apps]
	*	Bluetooth Low Energy General tool for development and testing with Bluetooth Low Energy official, v4.0.0 (v4.0.4 available)	Open	•	
	0	Programmer Tool for flash programming of nRF SoCs official, v3.0.4	Open	•	
	<i>Э</i> с.	Direct Test Mode RF PHY testing of Bluetooth Low Energy devices official, v2.0.3	Install	•	
	众	Getting Started Assistant Deprecated. Please use Toolchain Manager. official, v2.1.0	Install	•	
	((∕∖))	LTE Link Monitor Link monitor and AT command terminal official, v2.0.2	Install	•	
	-Ø-	Power Profiler App for use with Nordic Power Profiler Kits official, v3.5.3	Install	•	
	.aO()	RSSI Viewer Live visualization of RSSI per frequency for nRF52832 official, v1.4.2	Install	•	
	ම	Toolchain Manager Install and manage tools to develop with the nRF Connect SDK (NCS) official, v1.2.1	Install	•	
		Trace Collector Capture nRF91 modem trace official, v1.1.3	Install	*	



3.2 Connection Specifications

1. After the installation is finshed, the following window shows up. Click Generic Access to check the related info when the device is a master. Then click Start scan, the BLE devices can be scanned.

8 Bluetooth Low Energy v3.0.0		– 🗆 X
■ nRF52 Connectivity C90E6F6DB355	CONNECTION MAP SERVER SETUP ABOUT	8
COORDEREDBASS	Image: Service UUID 1800 Service UUID 1800 Service name Generic Access Device Name Service name Appearance Peripheral Preferred Connection Parameters Service Service Service Service Service Service name Generic Access Service name Peripheral Preferred Connection Parameters Service Service Service Service<	Petooth-numbers-database/tree/master/v1 Device API version: 5. Baud rate: 1000000. e.
SHOW SIDE PANEL		AUTOSCROLL LOG SHOW LOG

2. The scanned devices will show in the left window, while the old version shows in the right window.

8 Bluetooth Low Energy v3.0.0	-	
C90E6F6DB355	CONNECTION MAP SERVER SETUP ABOUT	
Discovered devices) Stop scan Clear Options Clear Connect 2 Details RFstar_0581 -69 dBm1 80:48:50:39:05:81 Connect 2 Details RFstar_0581 -69 dBm1 80:48:50:39:05:81 Connect 2 Details RFstar_AC2A -67 dBm1 90:35:EA:EB:AC:2A Connect 2 Details Connect 2 -57 dBm1 Connect 2 -57 dBm1 Connect 2 -57 dBm1 Ditails Connect 2 -57 dBm1 Connect 2 -57 dBm1	NRF5x Adapart 0:00E:6F:6D:83:55 Service UUID Beneric Access Service name Generic Access X Delete Save Save Clear Apply to device	
Details	13:45:52:231 Selected device with s/n C90E6F6DB355 13:45:52:230 Device setup completed 13:45:52:241 Opening adapter connectivity 4.1.4+Mar-11-2021-08-36-04. SoftDevice API version: 5. Baud rate: 100000 13:45:52:241 Opening adapter connected to COM11 13:45:52:252 Opening adapter connected to COM11 13:45:52:252 Successfully opened COM11. Baud rate: 1000000. Flow control: none. Parity: none. 13:45:52:263 Reset performed on adapter COM11 13:45:54:335 Adapter connected to COM11 opened 14:02:02:738 Scan started	DO.
SHOW SIDE PANEL	CLEAR LOG OPEN LOG FILE	SHOW LOG

3. If there are too many devices to find a specific device, you can click the small triangle of Option and enter the device name or MAC address in the filter box to filter the redundant devices. Check "Sort by signal strength" to select whether the signals are arranged in descending order from strong to weak.

8 Bluetooth Low Energy v3.0.0		- 0	×
C90E6F6DB355	CONNECTION MAP SERVER SETUP ABOUT		
Discovered devices Start scan Clear Options Sort by signal strength Filter: RF Active scan Timeout: 60 RFstar_E38F Connect Connec	RF5x Adapter C9:0E:6F:6D:83:55 Generic Access Generic Attribute		
Petans RFstar_9DEA -67 dBm → ContreFe83:9D:EA Connect Ø Details			
RFstar_0581 -69 dBm _ml 80:48:50:39:05:81 Connect 𝒴 • Details -70 dBm _ml RF-STAR-SMMT -70 dBm _ml FD:02:46:68:F0:82 Connect 𝒴 • Details -70 dBm _ml	14:08:56.053 Disconnected from device EF:1A:35:45:80:3E, reason: BLE_HCL_CONN_FAILED_TO_BE_ESTABLISHED 14:08:58.690 Connecting to device 14:09:00.817 Connected to device 90:35:EA:EB:AC:2A: interval: 7.5ms, timeout: 4000ms, latency: 0 14:09:00.855 ATT MTU updated for device 90:35:EA:EB:AC:2A, new value is 250 14:09:00.914 Connection parameters updated for device 90:35:EA:EB:AC:2A, new value is 250 14:09:00.921 Data length updated for device 90:35:EA:EB:AC:2A, new value is 251 14:09:00.912 Data length updated for device 90:35:EA:EB:AC:2A, new value is 251 14:09:00.913 Attribute value read, handle: 0x07, value (0x): 52-46-73-74-61-72-5F-41-43-32-41 14:09:01.639 Disconnected from device 90:35:EA:EB:AC:2A, reason: BLE_HCL_REMOTE_USER_TERMINATED_CONNECTION		
SHOW SIDE PANEL	CLEAR LOG OPEN LOG FILE	si 💽	HOW LOG

4. Click Connect to specify the slave, and the interface is as follows:

8 Bluetooth Low Energy v3.0.0		- 🗆 X
N nRF52 Connectivity A CONNECTION I	MAP SERVER SETUP ABOUT	
C90E6F6DB355 —		
Discovered devices	54	
Start scan Clear Contians Contians	E6F:6D:83:55	
 Options Sort by signal strength 		
Filter: RF Generic Ac	ccess RFstar_AC2A Peripheral \$	
Timeout: 60 Generic At	tribute	
RFstar_0581 -69 dBm	Generic Attribute	
80:4B:50:39:05:81 Connect &		
• Details	Generic Access	
RFstar_AC2A -72 dBm	Device Information	
90:35:EA:EB:AC:2A Connect @		
> Details	0000FFE00000010080000805F9B34FB	
RFstar_A4AB -71 dBm		
90:35:EA:EB:A4:AB Connect Ø	1D14D6EEFD634FA1BFA48F47B42119F0	
Details		
RFstar_EA2A -63 dBm		
D0.52.A0.57.EA.2A Connect Ø		
PEstar 203E C7 dBm d 1/203255 (V)	Connected to device EE-1 Ar35-//5-80-3E- intervals / time timeouts /000mc. Intervals (
EF:1A:35:45:80:3E Connect 6 14:08:56.053	Disconnected from device EF:1A:35:45:80:3E, reason: BLE_HCI_CONN_FAILED_TO_BE_	ESTABLISHED
Details		
RFstar_9DEA -67 dBm 1 14:09:00.817 0	Connected to device 90:35:EA:EB:AC:2A: interval: 7.5ms, timeout: 4000ms, latency: 0	
C0:17:EF:83:9D:EA Connect Ø 14:09:00.835 7	ATT MTO updated for device 90:35:EA:EB:AC:2A, new value is 250 Connection parameters updated for device 90:35:EA:EB:AC:2A; interval 20ms, timeout	4000ms. latency: 0
• Details 14:09:00.921		
RFstar_2A59 -78 dBm vi 14:09:01.639 A	Attribute value read, handle: 0x07, value (0x): 52-46-73-74-61-72-5F-41-43-32-41	I
SHOW SIDE PANEL CLEAR LOG OPEN		AUTOSCROLL LOG SHOW LOG

5. Multi connection operation: just click Connect in the scan window on the right (without disconnecting the



currently connected device), you can connect multiple slaves.

8 Bluetooth Low Energy v3.0.0					- 🗆 X
nRF52 Connectivity C90E6F6DB355	CONNECTION MAP SERVER SETUP ABO	DUT			1
Discovered devices					
Start scan Clear	■ nRF5x Adapter C9:0E:6F:6D:83:55	ø	6		
 Options Sort by signal strength 			1	1	
Filter: RF	Generic Access	RFstar Peripheral	RFstar Peripheral		
Timeout: 60		D6:52:A6:57:EA:2A	EF:1A(35)45(80)3E		
RFstar_E38F -62 dBm	Generic Attribute	Generic Access	Generic Access		
BC:33:AC:42:E3:8F • Details	2	Generic Attribute	Generic Attribute		
RFstar_EA2A -63 dBm D6:52:A6:57:EA:2A	al	Device Information	Device Information		
Details	2	A0E78D3975B541828FDCC4B7365C9062	A0E78D3975B541828FDCC4B7365C9062		
RFstar_803E -67 dBm				-	
Petails Connect a	2	UART over BLE	UART over BLE	J	
RFstar_9DEA -67 dBm	 	slave1	slave2		
C0:17:EF:83:9D:EA Connect a	Ø				
 Details 					
RFstar_0581 -69 dBm	.al				
80:48:50:39:05:81 Connect &	<mark>2</mark>				
Details	14:17:00.936 Disconnected from device C0:17:E	:F:83:9D:EA, reason: BLE_HCI_CONN_FAILED_1	TO_BE_ESTABLISHED		
RF-STAR-SMMT -70 dBm	14:17:03.934 Connecting to device				
FD:0D:40:0D:FU:02 Connect &	14:17:10.002 Connect canceled 14:17:11.158 Connecting to device				
PErter AAR	14:17:13.189 Connected to device 80:4B:50:39:0				
90:35:EA:EB:A4:AB	14:17:13.219 Disconnected from device 80:4B:5				
Details	2 14:17:15.174 Connecting to device				
SHOW SIDE PANEL	CLEAR LOG OPEN LOG FILE			AUTOSCROLL LOG	SHOW LOG



3.2 Read and Write Specifications

Device read operation. For example, to read the Device Name channel of the Generic Access service, you
only need to click the arrow to complete the reading, provided that the characteristic value of the service has
a read attribute.

8 Bluetooth Low Energy v3.0.0		- 🗆 X
C90E6F6DB355	CONNECTION MAP SERVER SETUP ABOUT	89
Discovered devices		
Active scan	Generic Access HP-5 IAR-5MMI FD:80:46:68:F0:82	Peripheral (2) 🗘
RF-STAR-SMMT -41 dBm	Generic Attribute Generic Access	A
FD:8D:46:68:F0:82 • Details	Device Name read write	C
RFstar_EA2A -51 dBmt D6:52:A6:57:EA:2A Connect 𝒞 ▶ Details Connect 𝔅	Appearance read 0000	
RFstar_803E -64 dBm EF:1A:35:45:80:3E Connect 𝔄 → Details Connect 𝔄	Peripheral Prefer read 10 00 3C 00 00 0	rred Connection Parameters 20 90 01
RFstar_AC2A -67 dBm	- Control & desce	Darahain.
90:35:EA:EB:AC:2A Connect &	14:25:15:969 Attribute value changed, handle: 0x19, value (0x): 01-00 14:25:15:979 Attribute value written, handle: 0x19, value (0x): 01-00	
RFstar_E679 -68 dBmI BC:33:AC:42:E6:79 Connect 𝒞 → Details Connect 𝔅	14:25:18:569 Attribute value changed, handle: 0x18, value (0x): 64-73 14:25:21:368 Attribute value changed, handle: 0x18, value (0x): 64-73 14:25:36:644 Attribute value written, handle: 0x16, value (0x): 11-11 14:25:46:462 Attribute value written, handle: 0x16, value (0x): 31-31-3	
RFstar_0581 -69 dBm1 80'48:50'39:05:81 SHOW SIDE PANEL	14:29:31.553 Attribute value read, handle: 0x03, value (0x): 52-46-2D	-53-54-41-52-2D-53-4D-4D-54

2. Device write operation. For example, to write UART RX channel of UART over BLE service, just fill in the data in the box in the figure and click the button indicated by the arrow, provided that the characteristic value of the service has write attribute.

8 Bluetooth Low Energy v3.0.0	- 🗆 X
RF52 Connectivity C90E6F6DB355 ▲	CONNECTION MAP SERVER SETUP ABOUT
Discovered devices ◆ Start scan □ Clear • Options Stort by signal strength Fliter: RF ✓ Active scan Timeout: 60 0	■ RF5x Adapter € ○ 09.0E.6F.6D.B3.55 € € • Generic Access FD.8D.46.68.FD.82.2 € Generic Attribute • UART over BLE ●
RF-STAR-SMMT -41 dBm .ut FD:80-46-68:F0-82 Connect 2 > Details -51 dBm .ut D6:52-A6:57:EA:2A -51 dBm .ut > Details Connect 2	UART RX winte VioReap write 31 31 31 31 33 UART TX motify 64 73 61 66 64 33 34 35 33 67 66 64 36 35 36 34 35 36 66 64 00 0A
RFstar_803E -64 dBm al EF:1A:35:45:80:3E Connect 𝒞 → Details RFstar_AC2A	
90.35:EA:EB:AC:2A Connect 2 • Details -68 dBm .∎ RFstar_E679 -68 dBm .∎ • Details Connect 2 • Details -69 dBm .∎	14:25:15.969 Attribute value changed, handle: 0x19, value (0x): 01-00 14:25:15.979 Attribute value written, handle: 0x19, value (0x): 01-00 14:25:15.979 Attribute value changed, handle: 0x19, value (0x): 01-00 14:25:18.569 Attribute value changed, handle: 0x18, value (0x): 64-73-61-66-64-33-34-35-33-67-66-64-36-35-36-34-35-36-66-40D-0A 14:25:21.368 Attribute value changed, handle: 0x18, value (0x): 64-73-61-66-64-33-34-35-33-67-66-64-36-35-36-34-35-36-66-40D-0A 14:25:21.66.64 Attribute value changed, handle: 0x16, value (0x): 11-11-11-11 14:25:36.644 Attribute value written, handle: 0x16, value (0x): 11-11-11-11 14:25:31.653 Attribute value written, handle: 0x16, value (0x): 51-31-31-33 14:29:31.553 Attribute value read, handle: 0x03, value (0x): 52-46-2D-53-54-41-52-2D-53-4D-4D-54
SHOW SIDE PANEL	CLEAR LOG OPEN LOG FILE OF SHOW LOG



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 Receive a notify message. For example, to receive the notify notification of UART over TX service from UART TX channel, you need to click the button indicated by the arrow to receive the message of the channel, provided that the characteristic value of the service has the notify attribute.

8 Bluetooth Low Energy v3.0.0			- 🗆 X
RF52 Connectivity C90E6F6DB355 ▲	CONNECTION MAP SERVER SETUP ABOUT		
Discovered devices ▶ Start scan ♥ Options ♥ Sort by signal strength Filter: ℝF ♥ Active scan Timeout:	Seneric Access Generic Attribute Generic Attribute		
RF-STAR-SMMT -41 dBmIl FD:8D:46:6B:F0:82 Connect 𝒜 • Details -51 dBmIl D6:52:A6:57:EA:2A Connect 𝒜 • Details -51 dBmIl BE:1A:35:45:80:3E -64 dBmIl EF:1A:35:45:80:3E Connect 𝒜	UART RX writeWoResp write 31 31 31 31 33 UART TX notify 6473 61 66 64 33 34 35 33 67 66 64 36 35 36 34 35 36 66 64 0D 0A 664000485A3F393E0A9E50E24DCCA.		
RFstar_AC2A -67 dBm	· · · · · · · · · · · · · · · · · · ·		
90:35:EA:EB:AC:2A • Details RFstar_E679 -68 dBm1 BC:33:AC:42:E6:79 • Details	14:25:36.644 Attribute value written, handle: 0x16, value (0x): 11-11-11-11 14:25:46.462 Attribute value written, handle: 0x16, value (0x): 31-31-31-33 14:29:31.553 Attribute value read, handle: 0x03, value (0x): 52-46-2D-53-54-41-52-2D-53-4D-4D 14:34:11.267 Attribute value changed, handle: 0x19, value (0x): 00-00 14:34:11.281 Attribute value written, handle: 0x19, value (0x): 00-00 14:34:13.126 Attribute value changed, handle: 0x19, value (0x): 01-00 14:04:10.126 Attribute value changed, handle: 0x19, value (0x): 01-00	-54	
Rt-Star_0581 -69 dBm	CLEAR LOG OPEN LOG FILE	AUTOSCROLL LOG	SHOW LOG



4 Capture Data Packets of BLE Sniffer

4.1 Minimum Requirements

Before you start, check that you have the required hardware and software.

Hardware requirements

- PC with a standard type-A USB port
- RF-DG-40A

Software requirements

- Download the Wireshark 2.4.5 and above version
 Wireshark download address: https://www.wireshark.org/#download
- Install the python v3.7.0 and above version
 Python v3.7.x environment download address: <u>https://www.python.org/downloads/release/python-378/</u>
- Download nRF Sniffer for Bluetooth LE v3.x.x environment
 Download address: <u>https://www.nordicsemi.com/Software-and-tools/Development-Tools/nRF-Sniffer-for-Bluetooth-LE/Download#infotabs</u>
- Operating system: macOS, Linux, or Windows 7 or later

4.2 Software Preparation

Pay attention to the following items when installing Wireshark

1. Click "Wireshark Desktop Icon".

Additional Tasks	-
Create shortcuts and associate file extensions.	
Create Shortcuts	
Wirechark Start Manu Itam	
Wirschart Deckton Icon	
Wireshark Origit Jaugh Tean	
Associate File Extensions	
Associate trace file extensions with Wireshark	
Extensions include 5vw, acp, apc, atc, bfr, cap, enc, erf, fdc, ipfix, lcap, mplog, out, pcap, pcapng, pklg, pkt, rf5, snoop, syc, tpc, tr1, trace, trc, vwr, wpc, and wpz.	

2. Click "USBPcap" and install.



V1.	2 -	May,	2023
-----	-----	------	------

USB Capture USBPcap is required to capture USB traffic. Should USBPcap be installed (experimental)?	
Currently installed USBPcap version USBPcap is currently not installed	
Install Install USBPcap 1.3.0.0 (Use Add/Remove Programs first to uninstall any undetected old USBPcap versions)	
Important notice In case of issue after installation, please use the system restore point created or read https://github.com/desowin/usbpcap/issues/3	

3. Python 2.7 and above development environment. Python 3.7 version is used here.

Click "next" at each step when installing python

4. Refer to the Chapter 3 for Preparation for Development Environment in "20220523 RF-DG-32B User Guide V1.2".

4.3 Instruction for Use

1. After the software is successfully installed, connect the RF-DG-40A to the PC via USB, open Wireshark, and select nRF Sniffer COMx.

双迎使用 Wireshark
捕获
️️️使用这个过滤器: 📕 输入捕获过滤器 ⋯
本地连接* 8
本地连接* 7
本地连接* 6
Adapter for loopback traffic capture
nRF Sniffer COM3
OSBPcap1
OSBPcap2
OSBPcap3

 Select -> View -> Interface Toolbar -> nRF Sniffer in the toolbar, the following interface will appear (by default, all BLE broadcast signals are captured).



🧖 正在捕获 nRF Sniffer COM3

文件(E)	编辑(E)	视图(⊻)	跳转(<u>G</u>)	捕获(<u>C</u>)	分析(<u>A</u>)	统计(<u>S</u>)	电话(Y)	无线(<u>W</u>)	工具(I)	帮助(<u>H</u>)

接口 70M3	 D sige All adverti 	sing	- Passkey / OOB key		
No. start ca	pture stop capture	Source restart capture	Destination	Protocol	Length
545	1.100727	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
546	1.202985	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
547	1.204415	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
548	1.205346	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
549	1.206138	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
550	1.206898	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
551	1.207661	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
552	1.208436	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
553	1.209350	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
554	1.210115	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
555	1.312014	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
556	1.313083	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
557	1.314097	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
558	1.314797	33:96:96:7e:48:63	Broadcast	LE LL	63
559	1.315413	33:96:96:7e:48:63	Broadcast	LE LL	63
560	1.316005	33:96:96:7e:48:63	Broadcast	LE LL	63
561	1.316565	22:d8:c0:8f:5e:98	Broadcast	LE LL	63
562	1.317104	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
563	1.317612	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
564	1.318142	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
565	1.318670	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
566	1.319181	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
567	1.420268	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
568	1.422069	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
569	1.423647	29:6e:cb:d7:75:5d	Broadcast	LE LL	63
570	1.425010	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
571	1.426279	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
572	1.427567	22:d8:c0:8f:5e:90	Broadcast	LE LL	63
573	1.428794	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
574	1.429940	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63
575	1.431143	1b:9c:99:dd:ba:b5	Broadcast	LE LL	63



3. Select any RF-star BLE slave development board to power on for broadcasting.





As shown in the red box in the figure below, click the device filter drop-down box to select the device with the



corresponding MAC address. After selecting the fixed device, only the data packets related to the device will be captured.

🧕 正在捕获 n	RF Sniffer COM15					
文件(F) 编辑	₩E) 视图(V) 跳转(G)	捕获(C) 分析(A) 统计(S) 电话	(Y) 无线(W) 工具(T) 帮助(H)			
🥂 📕 🧕 🤇		⇔ ⇔ 🕾 🗿 🛓 📃 🗏 🍳	Q. Q. III			
📕 应用显示过	滤器 … <ctrl-></ctrl->					
接口 COM15	✓ Device All advert	tising devices	∨ Passkey / 00B key			Adv Hop 37, 38, 39
No.	Time	Source	Destination	Protocol	Length	Info
272	10.043112	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
273	10.044334	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
274	10.145588	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
275	10.146901	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
276	10.148104	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
277	10.251363	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
278	10.254278	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
279	10.256212	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
280	10.357439	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
281	10.358329	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
282	10.358993	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
283	10.460301	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
284	10.460996	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
285	10.461535	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
286	10.563322	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
287	10.564045	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
288	10.564562	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
289	10.666381	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
290	10.667181	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
291	10.667679	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
292	10.769130	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
293	10.769824	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
294	10.770341	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
295	10.872103	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
296	10.873459	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
297	10.975414	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
298	10.976782	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
299	10.977490	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
300	10.977978	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
301	11.079897	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND
302	11.081162	2d:71:64:5b:0e:fa	Broadcast	LE LL	63	ADV_NONCONN_IND

5. After Wireshark selects the MAC address device, the broadcast packet, scan request packet and scan response

packet of the device will be captured.

•						
No.	Time	Source	Destination	Protocol	Length	Info
10094	458.592234	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10095	458.593469	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10096	458.795753	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10097	458.797325	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10098	458.798505	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10099	459.000875	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10100	459.002667	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10101	459.003979	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10102	459.206072	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10103	459.207238	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10104	459.208045	ba:03:24:2d:79:8c	Broadcast Scan request pa	cket _{LE} LL	59	ADV_IND
10105	459.208734	46:1c:9d:dd:3b:58	ba:03:24:2d:79:8c	LE LL	38	SCAN_REQ
10106	459.209447	ba:03:24:2d:79:8c	Broadcast	LE LL	58	SCAN_RSP
10107	459.411627	ba:03:24:2d:79:8c	Broadcast Scan Response	LE LL	59	ADV_IND
10108	459.413303	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10109	459,414699	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10110	459.617545	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10111	459.618539	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10112	459.619232	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10113	459.821226	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10114	459.822962	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10115	459.824387	ba:03:24:2d:79:8c	Broadcast Broadcast pack	ket LE LL	59	ADV_IND
10116	460.026561	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10117	460.028202	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10118	460.029887	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10119	460.231604	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10120	460.232516	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10121	460.233123	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
10122	460,434175	ba:03:24:2d:79:8c	Broadcast	LELL	59	ADV_IND
10123	460.435742	ba:03:24:2d:79:8c	Broadcast	LE LL	59	ADV_IND
			- • •			

6. The data packets that the device communicates with any master can be captured, including the connection



process and the data packets after the connection.

Double-click any packet to view the specific content. For example, the device captures the broadcast packet as follows:



7. When a connection event occurs, all data communication processes of the connection process can be captured. After connecting the device, the APP interface is displayed as follows:





Use the serial assistant to send the ASCII code "123456" to the BLE transparent transmission module. After receiving, the BLE module will forward the data to the APP. The data captured by Sniffer is the data sent by BLE to the APP, as shown in the following figure:

Delta time (μs end to start): 149 [Delta time (μs start to start): 229]
Bluetooth Low Energy Link Layer
Access Address: 0x18f044f1
<pre>[Master Address: 5d:ff:8e:16:be:d2 (5d:ff:8e:16:be:d2)]</pre>
[Slave Address: ba:03:24:2d:79:8c (ba:03:24:2d:79:8c)]
> Data Header: 0x0d0a
[L2CAP Index: 112]
CRC: 0x98bcde
> Bluetooth L2CAP Protocol
Bluetooth Attribute Protocol
> Opcode: Handle Value Notification (0x1b)
∽ Handle: 0x001b (Unknown: Unknown)
[Service UUID: Unknown (0xffe0)] Corresponding service, characteristic value and handle
[UUID: Unknown (0xffe4)]
Value: 313233343536 Write data:123456 in ASCII code
0000 03 20 00 02 c4 4e 06 0a 01 00 36 cd 07 95 00 00 · · · · N· · · · 6· · · ·
0010 00 f1 44 f0 18 0a 0d 09 00 04 00 1b 1b 00 31 32D
0020 33 34 35 36 19 3d 7b 3456 ={
Write data

Similarly, we can capture the data packets sent by the APP to the BLE module. The data captured by Sniffer after

Access Address: 0x4740979c	
[Master Address: 44:e2:42:1f:da:cb (44:e2:42:1f:da:cb]	
[Slave Address: ba:03:24:2d:79:8c (ba:03:24:2d:79:8c]	
> Data Header: 0x0a02	-
[L2CAP Index: 104]	
CRC: 0x82c1cd	
✓ Bluetooth L2CAP Protocol	
Length: 6	
CID: Attribute Protocol (0x0004)	
✓ Bluetooth Attribute Protocol	
> Opcode: Write Request (0x12)	
Y Handle: 0x0020 (Unknown: Unknown)	
[Service UUID: Unknown (0xffe5)]	
[UUID: Unknown (0xffe9)]	
Value: 123456 Data "0x123456" sent from app to RF-star module	
[Response in Frame: 1955]	
0000 03 1d 00 02 fc c8 06 0a 03 0a 2d be 03 62 39 00b9.	
0010 00 9c 97 40 47 02 0a 06 00 04 00 12 20 00 12 34 ···@G····•	
0020 56 41 83 b3 VA··	



5 Capture Data Packets of ZigBee Sniffer

5.1 Minimum Requirements

Before you start, check that you have the required hardware and software.

Hardware requirements

- PC with a standard type-A USB port
- RF-DG-40A

Software requirements

- Official ZigBee Sniffer firmware
 Download address: <u>https://github.com/NordicSemiconductor/nRF-Sniffer-for-802.15.4</u>
- Wireshark 2.4.5 and above version
 Download address: <u>https://www.wireshark.org/#download</u>
- Operating system: macOS, Linux, or Windows 7 or later

5.2 Software Preparation

Pls refer to Chapter 4.2.

5.3 Environment Setup

5.3.1 Configure Wireshark Environment

1. Open Wireshark -> help -> about Wireshark -> folder -> double-click to open extcap path, as shown in the figure

below:

fireshark 作者	文件夹 插件 快捷鍵 致谢 许可	
按路径过渡		
名称	位置	典型文件
"文件"对话框 临时 个人配置 全局配置 系统 程序 个人插件 会局场件	C:\Users\FWANG\Documents\ C:\Users\FWANG\AppData\Local\Temp C:\Users\FWANG\AppData\Roaming\Wireshark C:\Program Files\Wireshark C:\Program Files\Wireshark C:\Users\FWANG\AppData\Roing\Wireshark\plugins\3.0 C:\Psogram Files\Wireshark\plugins\3.0	捕获文件 无标题捕获文件 dfilters, preferences, ethers, dfilters, preferences, manuf, ethers, ipxnets 程序文件 二进制适件 一进制适件
全局 Lua 插件 全局 Lua 插件	C:\Users\FWANG\AppData\Roaming\Wireshark\plugins C:\Program Files\Wireshark\plugins	lua 脚本 lua 脚本
Extcap 路径 MaxMind DB 路径 MaxMind DB 路径 MIB/PIB 路径	C:\Program Files\Wireshark\extcap	Extcap 插件搜索路径 MaxMind DB 数据库搜索路径 MaxMind DB 数据库搜索路径 SMI MIB/PIB 搜索路径

2. Unzip the nRF-Sniffer-for-802.15.4-master.zip file and copy the "nrf802154_sniffer.py" and "nrf802154_sniffer.bat"

名称	修改日期	类型	大小	
SnifferAPI	2020/5/18 17:35	文件夹		
🚄 androiddump.exe	2020/4/9 7:03	应用程序	346 KB	
ciscodump.exe	2020/4/9 7:03	应用程序	329 KB	
nrf_sniffer.bat	2018/10/10 20:48	Windows 批处理	1 KB	
🔒 nrf_sniffer.py	78 295	Python File	21 KB	
💿 nrf802154_sniffer.bat	2019/4/30 22:17	Windows 批处理	1 KB	
nrf802154_sniffer.py	2019/4/30 22:17	Python File	22 KB	
	Eorof 100 EErri	Tychon The	ZZ KD	
randpktdump.exe	2020/4/9 7:03	应用程序	324 KB	
<pre>randpktdump.exe requirements.txt</pre>	2020/4/9 7:03 2018/10/10 20:48	应用程序 文本文档	324 KB 1 KB	
<pre>randpktdump.exe requirements.txt sshdump.exe</pre>	2020/4/9 7:03 2018/10/10 20:48 2020/4/9 7:03	应用程序 文本文档 应用程序	324 KB 1 KB 323 KB	

files in the nrf802154_sniffer folder to the Wireshark extcap path just opened. As shown in the figure below:

No matter how complicated the environment is, the operation can work as long as there are two files.

Open wireshark to set the parameters, and click Ctrl + Shift + P to enter Wireshark preferences. Search Protocols
 -> IEEE 802.15.4, click Decryption Keys, and edit the decryption key to the following settings:

"Decryption key": 00112233445566778899 aabbccddeeff

"Decryption key index": 0

"Key hash": Thread hash

📶 Keys		×
Decryption key 00112233445566778899aabbccddeeff	Decryption key index 0	Key hash Thread hash
	<u>Users qq AppDete Reeain</u> OK 夏豹白	Cancel Help

4. Search Protocols -> Thread

"Thread sequence counter": 0000000

Click "Use PAN ID as first two octets of master key"



Click "Automatically acquire Thread sequence counter", as shown in the figure below:

TDS	Use PAN ID as first two octets of master key Automatically acquire Thread sequence counter
TeamSpeak2 TELNET Teredo TETRA TFP	信驰达

5. Search Protocols -> 6LoWPAN

Click "Derive ID according to RFC 4944"

"Context 0": fdde:ad00:beef:0::/64

É

"Context 1": 64:FF9B::/96 - for working with Nordic Thread Border Router

"Context 2": Native IPv6 global prefix that is being propagated in the Thread Network.

Name Resolution A Protocols > 29West 2dparityfec 3GPP2 A11	IPv6 over Low power Wireless Personal Area Metworks ☐ Derive IID according to RFC 4944 ☑ IID has Universal/Local bit ☑ Show IPv6 summary in protocol tree
6LoWPAN	Context 0 fdde:ad00:beef:0::/64
802.11 Radio 802.11 Radi 9P	Context 1 64:FF9B::/96 - for working with Nordic Thread Border Router Context 2 Native IPv6 global prefix that is being propagated in the Thread Network
A-bis OML	Context 3

6. Search Protocols -> CoAP

"CoAP UDP port to": 61631

Wireshark · 首选项

CIP	^	Constrained	Application Protocol
CIP I/O		CoAP UDP port	61631
CISCO3 ER		CoAP TCP port	5683
CLNP			C.C.ar
CMP			
CMPP			
CN/IP			
CoAP			



5.3.2 Specification for ZigBee Sniffer

- 1. Make sure that it is the firmware of ZigBee Sniffer in the module
- 2. Make sure that RF-DG-40A is working in the well-prepared environment
- 3. Then open wireshark, it will identify a nRF sniffer for 802.15.4 device.

捕获	
"使用这个过滤器: [月] 输入拥获过滤器	
本地连接* 8	
本地连接* 10	
本地连接* 2	
以太网	m
WLAN	S
本地连接* 9	(1000000000000000000000000000000000000
Adapter for loopback traffic capt	ture MMM
本地连接* 1	ſ
• nRF Sniffer for 802.15.4	
O Cisco remote capture	
Random packet generator	
SSH remote capture	驰
UDP Listener remote capture	

4. Set the corresponding ZigBee channel.

Channel	16	
Dut-Of-B <mark>and meta-data</mark>	IEEE 802. 15. 4 TAP	3

5. Click start to grab the ZigBee communication package under the current channel.

💰 正在捕获 nRF Sniffer	for 802.15.4														
文件(E) 编辑(E) 视图(V) 影時(G) 捕獲	薛(C) 分析	(A) 统计(S)	电话(Y)	无线(<u>W</u>)	工具(工) 報	助(<u>H</u>)								
a 🔳 🙋 💿 🛄 🛅	R G 9 0		* = =	e e	a. III										
」应用显示过滤器··· <℃	r1-/>														
o. Time S	ource		PHT Protoco	1	Length	Delta t	ime (#s end to	start)	SN	NESN	More Data	Event counter	Info		
1 0.000000		_	IEEE	802.15.4									Beacon	Request	
2 0.540711		-21	IEEE	802.15.4									Beacon	Request	
3 1.044461			IEEE	802.15.4									Beacon	Request	
4 1.565181			IEEE	802.15.4									Beacon	Request	
5 2.087549			IEEE	802.15.4									Beacon	Request	
6 4.595255			IEEE	802.15.4									Beacon	Request	
7 5.115028			IEEE	802.15.4									Beacon	Request	
8 5.637915			IEEE	802.15.4									Beacon	Request	
9 6.161015			IEEE	802.15.4									Beacon	Request	
10 6.683047			IEEE	802.15.4									Beacon	Request	
٢															
Frame 3: 36 byte IEEE 802.15.4 T/	es on wire (2 AP	288 bits)), 36 byte	es captur	ed (28	8 bits) on	interface w	ireshark	_extcap	1996, id	0				
1002.15.4 C	Ciald, Ost:	Droadcas	Turner			tion Addag	andan Madai	Shant /16			and any TEEE	5+d 902 15	4 2002	Course Addressing Ma	da e Ma
Sequence Numb	er: 139	03, Frame	e Type: C	ommand,	Jestina	ition Addre	ssing mode:	Short/1	o-Dit,	Frame ver	rsion: IEEE	Std 802.15.	4-2003,	Source Addressing Mo	ie: No
	AN: 0xffff														
Destination F															
Destination F Destination:	Øxffff														



6 Programming

The nRF52840 Dongle can be programmed through the built-in USB bootloader.

Before you start, check Getting started on page 3.

To program the Dongle, it must be in bootloader mode.

The Dongle can be made to enter bootloader mode in one of the two ways:

• Trigger the nRF52840 USB DFU endpoint.

The firmware to support this is embedded in all nRF Connect for Desktop apps for the nRF52840 Dongle. If you add the DFU Trigger Library (USB) to your custom device firmware, you will be able to trigger the DFU from nRF Connect for Desktop without using any buttons. For documentation, see DFU Trigger Library (USB), which is part of the nRF5 SDK v15.2.0.

• For Dongles with applications missing the USB DFU endpoint: Press the RESET button.



When the nRF52840 Dongle has entered the bootloader mode, LD2 pulses red. The Dongle is now ready for programming.

All the nRF Connect for Desktop apps require specific firmware to be present on the nRF52840 Dongle to function correctly. The apps will update the firmware if needed. If you want to upload custom firmware to the Dongle, you can do this by using the dedicated Programmer programming app, or nrfutil.



7 Electrostatics Discharge Warnings

The module will be damaged by the discharge of static. RF-star suggests that all modules should follow the 3 precautions below:

- 1. According to the anti-static measures, bare hands are not allowed to touch modules.
- 2. Modules must be placed in anti-static areas.
- 3. Take the anti-static circuitry (when inputting HV or VHF) into consideration in product design. Static may result in the degradation in performance of the module, even causing the failure.





8 Revision History

Date	Version No.	Description
2020.04.17	V0.1	The initial version is released.
2020.04.23	V1.0	Add SWD interface specification.
2020.09.17	V1.1	Add ZigBee Sniffer packet capture instructions.
		Update pin diagram.
2020.11.25	V1.1	Change the error description of the LED color when entering BootLoader.
2021.02.06	V1.2	Add BLE Sniffer function specification.
2023.05.26	V1.2	Update the Shenzhen office address.

Note:

1. The document will be optimized and updated from time to time. Before using this document, please make sure it is the latest version.

2. To obtain the latest document, please download it from the official website: www.rfstariot.com and www.szrfstar.com.



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