

Type 2BP UWB[®] Module EVK

- NXP SR150

PnP Binary Test Guide - H



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About This Document

This guide describes how to perform the Ranging test using PnP binary on with Type 2BP module EVK.









Audience & Purpose

This guide is for developers and RF engineers who will develop software on Murata Type 2BP module.

Document Conventions

Table 1 describes the document conventions.

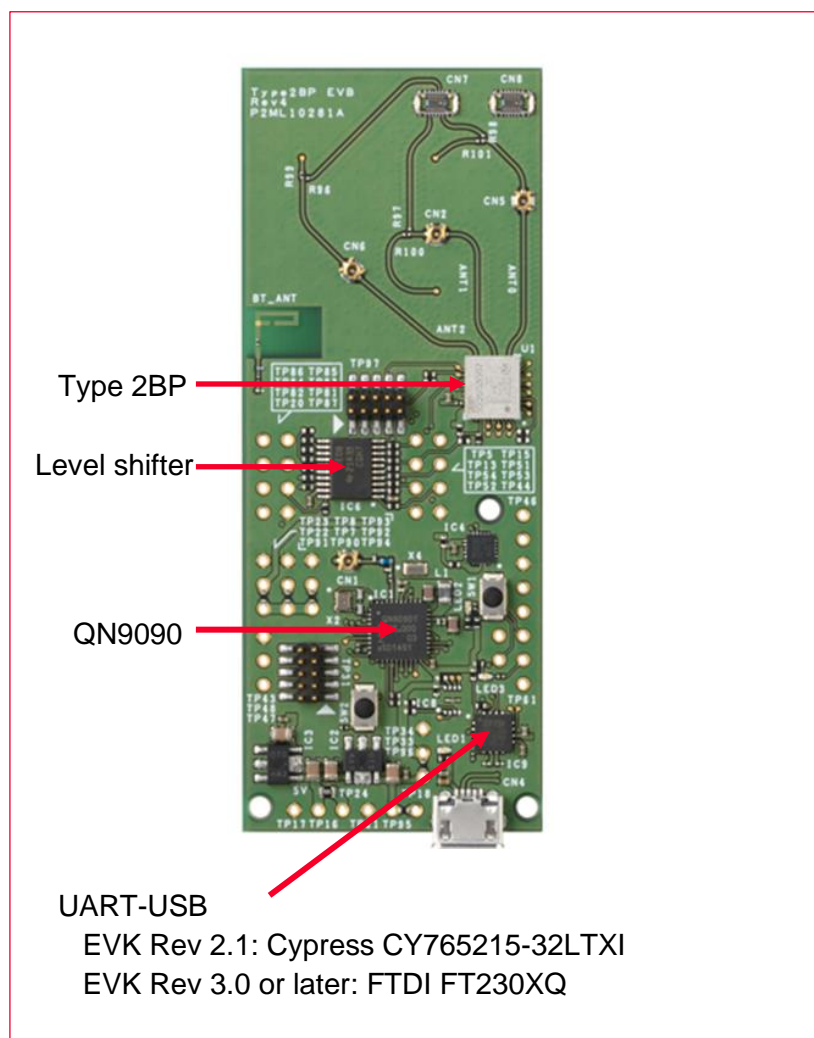
Table 1: Document Conventions

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: Type 2BP Product Page  Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. Example: Standalone Mode/PnP Mode  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.
<pre># Console I/O comment // Code snippet comment</pre>	Console I/O or Code Snippet Comment This text Style denotes a console input/output or code snippet comment. <ul style="list-style-type: none"> 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 Standalone Mode/PnP Mode

Figure 1 shows the different parts of Type 2BP EVK.

Figure 1: Type 2BP EVK



The Type 2BP/SR150 firmware is combined into the binary for QN9090. It is downloaded automatically when the EVK is powered on.

There are two modes of the binary:

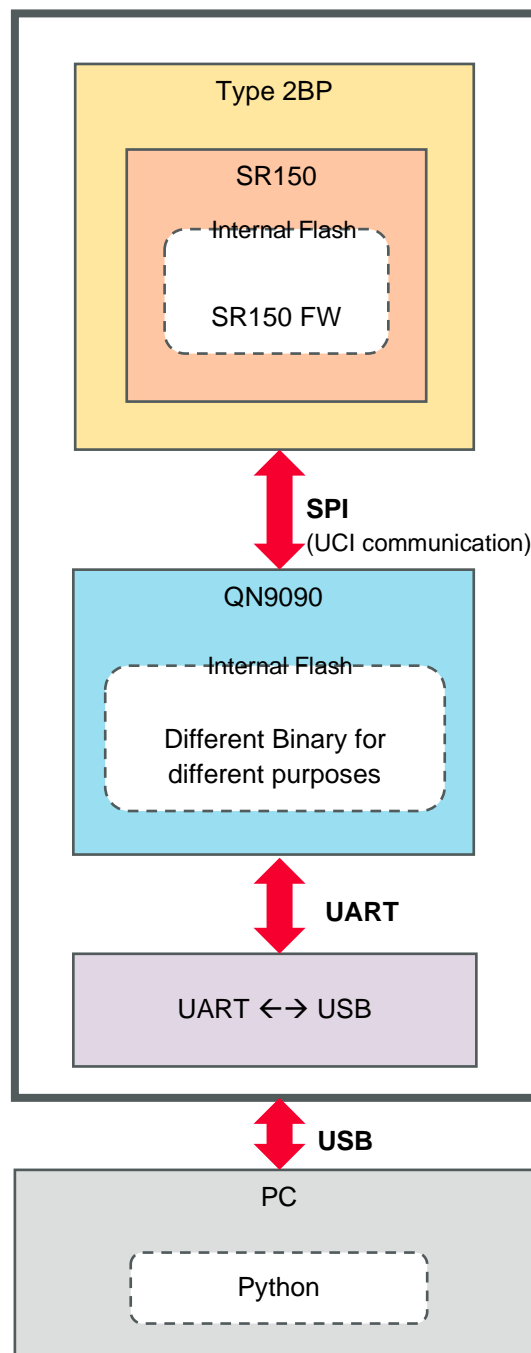
1. **Standalone mode:** This mode is for the final product. In this mode, the Type 2BP/SR150 is controlled by the program in QN9090. A sample program of the standalone mode is provided in the SDK.
2. **PnP mode:** PnP mode is used to bypass the UCI commands to UART, allowing Type 2BP/SR150 to be controlled from PC using UCI commands.



The same firmware is used for both standalone mode and PnP mode.

The structure is shown in エラー! 参照元が見つかりません。 below.

Figure 2: Type 2BP EVK Software Structure



2 Pair Ranging Test with PnP Mode Steps

This section describes how to do UWB ranging between two Type 2BP EVKs.

For pair ranging test:

1. Prepare two Type 2BP EVKs. (Revision 2.1 or later)
2. Write PnP binary in the flash of QN9090 (if not programmed)
3. Turn on both the EVKs and run the test python scripts. One EVK will be initiator and the other will be responder.
4. Check the log of python script, where the distance and Angle of Arrival (AoA) results will appear.

These steps are detailed in [Section 2.1](#) .

2.1 Detailed Procedure



Advance Confirmation

When operating in PnP mode, care must be taken with the combination of PnP binary file and python script file.

The following combinations PnP binary files and python script files should work.


Table 2: Compatible PnP Binary and Python Script File

SDK Version	PnP Binary ¹	Python Script File ²
V04.06.00	pnp3MFW_Rhodes4_SR150-v04.06.00.bin	MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600.py MTD_SCP_102_A_DS_TWR_SR150_UART_interface_v040600.py
V04.04.03	pnp3MFW_Rhodes4_SR150-ROW_PROD-v04.04.03.bin	MTD-SCP-071-A_DS-TWR_SR150_Unicast_v04.04.03.py
V04.02.01	2bp_v04_02_01_pnp.bin	MTD-SCP-067-B_DS-TWR_SR150_Unicast_v04.02.01.py
V03.15.11	2bp_pnp_v03.15.11.bin	MTD-SCP-026-A_DS-TWR_SR150_Unicast_v03.14.05.py
V03.14.05	2bp_pnp_v03.14.05.bin	
V03.13.03	2bp_pnp_v03.13.03.bin	MTD-SCP-025-A_DS-TWR_SR150_Unicast_FW32.py

We recommend that you use the latest version of the SDK.

2.1.1 Write PnP Binary in the Flash of QN9090

This section details the procedure of flashing the PnP binary to the QN9090 Flash of Type 2BP EVK.

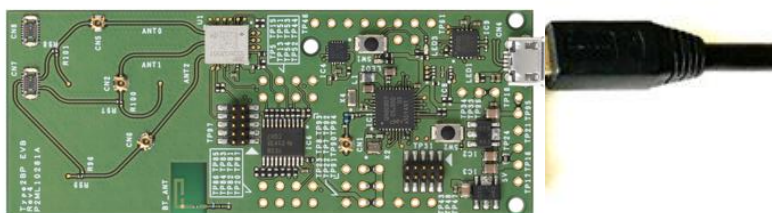
The DK6Programmer tool is used to flash the binary. Refer to [Appendix A](#)  for details on how to install the tool.

1. Connect the EVK with PC through USB cable as shown in **Figure 3** below.

¹ Refer to the respective SDK sites for more information on PnP binary file information.

² Download it from the "Test Guide" section on the 2BP Document Site.

Figure 3: Connect EVK with PC to Flash

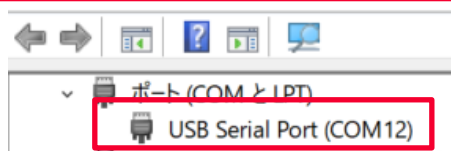


Connect the EVK with PC through USB cable

2. Check the COM port number on Device Manager. In the example shown in **Figure 4** below, the port number is detected as COM12.

Rev2.1 EVK uses Cypress CY765215-32LTXI for UART \leftrightarrow USB and it has two UART channels. Therefore, two COM ports are detected per EVK on the PC. For detecting the correct COM port for Rev2.1 EVK, please see [Appendix C](#).

Figure 4: Check COM Port Number



3. Open the DK6Programmer path in Command Prompt and then run the command shown below.

```
.\DK6Programmer.exe -V 0 -P 1000000 -s COM12 -Y -p pnp3MFW_Rhodes4_SR150-ROW_PROD-v04.04.03.bin
```

The command specifies the USB serial port number (COM12) and the path to the binary (2bp_pnp_v03.13.03.bin). An example of the output is shown in **Figure 5** below.

Figure 5: Binary Flash Result

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.1645]
(c) Microsoft Corporation. All rights reserved.

C:\npx\DK6ProductionFlashProgrammer>.¥DK6Programmer.exe -V 0 -P 1000000 -s COM12 -Y -p 2bp_pnp_v03.13.03.bin
COM12: Connected at 115200
COM12: Detected QN9090 with MAC address FF:FF:FF:FF:FF:FF:FF:FF
COM12: Selected memory: FLASH
COM12: Programming FLASH at 0x0
COM12: Partial erase required on memory FLASH, addr=0x00000000, length=339020
COM12: The area to erase is not an exact multiple of the erase block size. Erase data from 0x00000000 to 0x00052e00?
COM12: Forcing operation due to command line argument
COM12: Completed
COM12: Memory programmed successfully

C:\npx\DK6ProductionFlashProgrammer>
```

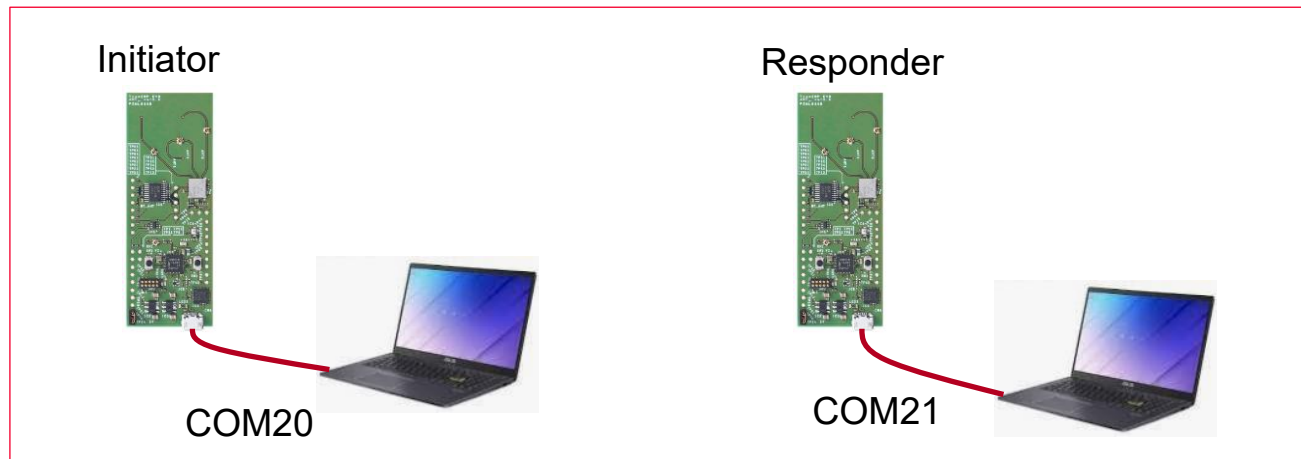


This example uses PnP binary of SDK v04.04.03 case, in case there is newer version, please use that.

2.1.2 Ranging Test Setup

In this example, Type 2BP EVKs are used, one as Initiator and the other as Responder. The test setup is shown in **Figure 6**.

Figure 6: Ranging Test Setup



To run the python script, additional libraries need to be installed. Run the commands below to install those.

```
pip install zmq  
pip install pyserial matplotlib numpy pycryptodome PyYAML
```

2.1.3 Ranging Test Using Python Script (SDK v04.04.03 or earlier)

Run the following command on one Type 2BP EVK to start the test as Initiator.

```
py MTD-SCP-071-A_DS-TWR_SR150_Unicast_v04.04.03.py i COM20
```

Run the following command on the other Type 2BP EVK to start the test as Responder.

```
py MTD-SCP-071-A_DS-TWR_SR150_Unicast_v04.04.03.py r COM21
```



The COM port setting may vary depending on the environment, please set proper COM ports that are connected to Type 2BP EVKs.

An example of the commands is shown in **Figure 7** below. The log generated on the terminals will show the result of the ranging test, as shown in **Figure 8** below.

Figure 7: Initiating the Ranging Test

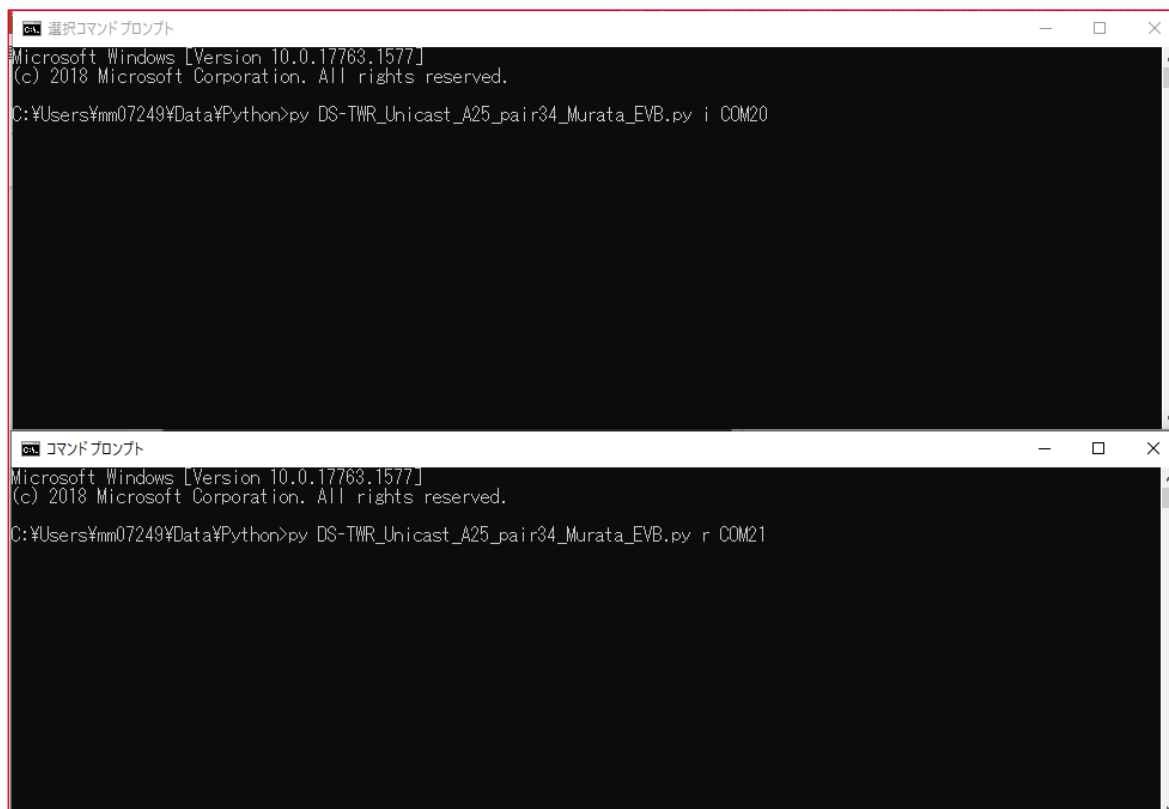
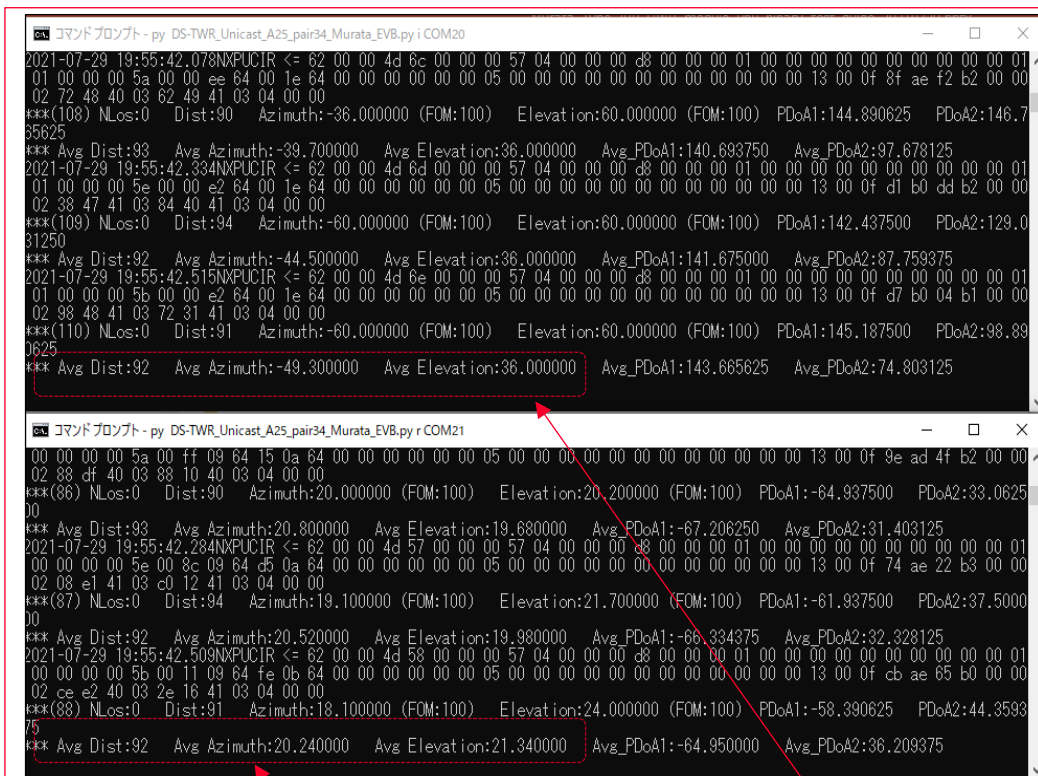


Figure 8: Ranging Result of Initiator and Responder

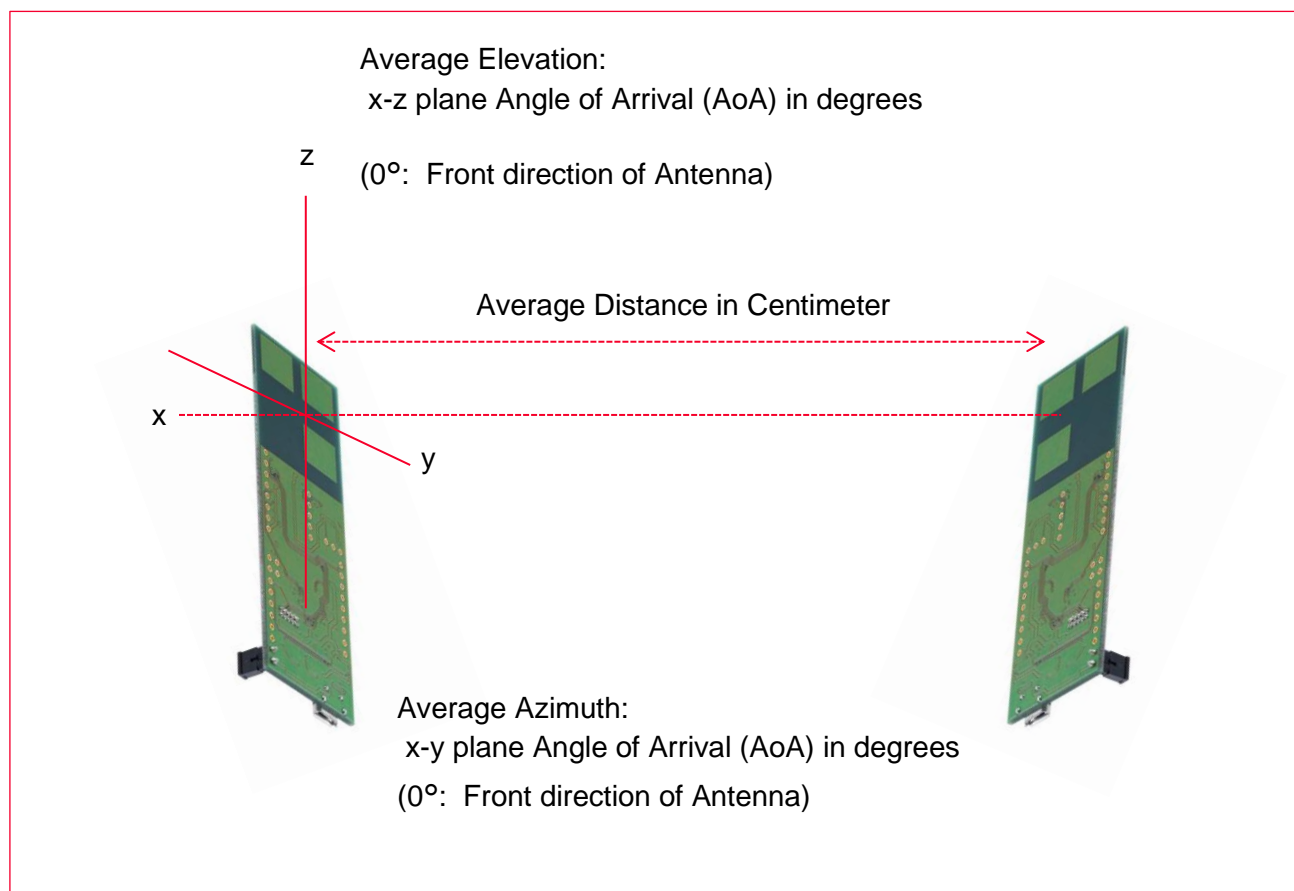


Ranging result of responder

Ranging result of initiator

Figure 9 shows the test result measurements.

Figure 9: Ranging Test Result Measurement



2.1.4 Ranging Test Using Python Script (SDK v04.06.00)

PnP mode in SDK v04.06.00, two script files and two Bat files are used. When execute the Bat file, the corresponding script will be executed.

Use the following Bat file on one Type 2BP EVK to start the test as Initiator.

i.bat file

```
py -m MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600 i COM17
pause
```

Use the following Bat file on another Type 2BP EVK to start the test as Responder.

r.bat file

```
py -m MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600 r COM8
pause
```



The COM port setting may vary depending on the environment, please set proper COM ports that are connected to Type 2BP EVK in the Bat file.

Double-clicking each Bat file will execute the corresponding script file in **Figure 10** below. The log generated on the terminals will show the result of the ranging test, as shown in **Figure 11** below.

```
C:\WINDOWS\system32\cmd.exe  
C:\>NXP\MTD-SCP-102-A_DS-TWR_SR150_Unicast_v04.06.00>py -m MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600 i COM17  
#####  
File Name: MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600.py  
Date Time: 2024-03-14 16:01:59.788390  
#####  
Role:Initiator Port:COM17 Nb Meas:0 Timestamp:False Range Plot:False  
Configure serial port...  
Serial port configured.  
Start adding commands to the queue...  
adding commands to the queue completed  
Start processing...  
Read from serial port started  
Write to serial port started  
NXPUCIX => 2E 00 00 02 73 04  
NXPUCIR <= 4E 00 00 01 00  
NXPUCIR <= 60 01 00 01 01  
NXPUCIX => 20 00 00 01 00  
NXPUCIR <= 60 07 00 01 0A  
NXPUCIX => 20 00 00 01 00  
NXPUCIR <= 40 00 00 01 00  
  
C:\WINDOWS\system32\cmd.exe  
C:\>NXP\MTD-SCP-102-A_DS-TWR_SR150_Unicast_v04.06.00>py -m MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600 r COM8  
#####  
File Name: MTD-SCP-102-A_DS-TWR_SR150_Unicast_v040600.py  
Date Time: 2024-03-14 16:02:04.039565  
#####  
Role:Responder Port:COM8 Nb Meas:0 Timestamp:False Range Plot:False  
Configure serial port...  
Serial port configured.  
Start adding commands to the queue...  
adding commands to the queue completed  
Start processing...  
Read from serial port started  
Write to serial port started  
NXPUCIX => 2E 00 00 02 73 04  
NXPUCIR <= 60 07 00 01 0A  
NXPUCIX => 2E 00 00 02 73 04  
NXPUCIR <= 4E 00 00 01 00  
NXPUCIR <= 60 01 00 01 01  
NXPUCIX => 20 00 00 01 00  
NXPUCIR <= 60 07 00 01 0A
```

```
C:\WINDOWS\system32\cmd.exe
2 64 ED F5 64 00 00 00 00 00 05 55 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 E5 12 84 D1 4
1 03 ED F5 36 E9 41 03 2E 2E 77 D0 80 D0 30 30 73 D0 80 D0
*** (70) NLos:0 Dist:13 Azimuth:37.8 (FOM:100) Elevation:-20.1 (FOM:100)
*** RSSI:-42.5 PDoA1:-92.968750 PDoA2:-45.578125
*** Avg Dist:9 Avg Azimuth:38.5 Avg Elevation:-16.5
NXPUCIR <= 62 00 00 5C 47 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 22 22 00 00 0B 00 82 1
3 64 4D F8 64 00 00 00 00 05 55 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 82 13 66 D0 4
1 03 4D F8 DE EB 41 03 2E 2E 80 D0 80 D0 30 30 7E D0 80 D0
*** (71) NLos:0 Dist:11 Azimuth:39.0 (FOM:100) Elevation:-15.4 (FOM:100)
*** RSSI:-42.5 PDoA1:-95.203125 PDoA2:-40.265625
*** Avg Dist:10 Avg Azimuth:38.6 Avg Elevation:-16.9
NXPUCIR <= 62 00 00 5C 48 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 22 22 00 00 08 00 F0 1
2 64 96 F9 64 00 00 00 00 05 54 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 F0 12 58 D1 4
1 03 96 F9 84 ED 41 03 2F 2F 97 D0 80 D0 30 30 95 D0 80 D0
*** (72) NLos:0 Dist:8 Azimuth:37.9 (FOM:100) Elevation:-12.8 (FOM:100)
*** RSSI:-42.0 PDoA1:-93.312500 PDoA2:-36.921875
*** Avg Dist:10 Avg Azimuth:38.7 Avg Elevation:-16.4
NXPUCIR <= 62 00 00 5C 49 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 22 22 00 00 09 00 A3 1
2 64 BE FA 64 00 00 00 00 05 53 00 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 A3 12 4E D2 4

C:\WINDOWS\system32\cmd.exe
*** (59) NLos:0 Dist:8 Azimuth:6.2 (FOM:100) Elevation:0.2 (FOM:100)
*** RSSI:-42.0 PDoA1:-16.312500 PDoA2:-0.843750
*** Avg Dist:7 Avg Azimuth:8.0 Avg Elevation:2.1
NXPUCIR <= 62 00 00 5C 3C 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 11 11 00 00 0A 00 F2 0
3 64 0E 00 64 00 00 00 05 54 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 F2 03 96 F5 4
0 03 0E 00 4A FF 40 03 2F 2F 96 D0 80 D0 2F 2F 93 D0 80 D0
*** (60) NLos:0 Dist:10 Azimuth:7.9 (FOM:100) Elevation:0.1 (FOM:100)
*** RSSI:-42.0 PDoA1:-20.828125 PDoA2:-1.421875
*** Avg Dist:7 Avg Azimuth:8.0 Avg Elevation:1.7
NXPUCIR <= 62 00 00 5C 3D 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 11 11 00 00 08 00 D0 0
3 64 DC FF 64 00 00 00 05 55 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 D0 03 DA F5 4
1 03 DC FF CE FE 41 03 2F 2F 79 D0 80 D0 2F 2F 75 D0 80 D0
*** (61) NLos:0 Dist:8 Azimuth:7.6 (FOM:100) Elevation:-0.3 (FOM:100)
*** RSSI:-42.5 PDoA1:-20.296875 PDoA2:-2.390625
*** Avg Dist:7 Avg Azimuth:8.0 Avg Elevation:1.5
NXPUCIR <= 62 00 00 5C 2E 00 00 01 00 00 00 C8 00 00 00 01 00 00 00 00 00 00 01 11 11 00 00 0B 00 16 0
3 64 1C 00 64 00 00 05 52 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 02 01 02 00 02 02 03 16 03 DE F7 4
1 03 1C 00 A6 FF 41 03 2F 2F 74 D0 80 D0 2F 2F 70 D0 80 D0
*** (62) NLos:0 Dist:11 Azimuth:6.2 (FOM:100) Elevation:0.2 (FOM:100)
```


Ranging result of initiator

3 Appendix A: DK6Programmer Installation



Rev 3.0 or later EVK is compatible with DK6Programmer.

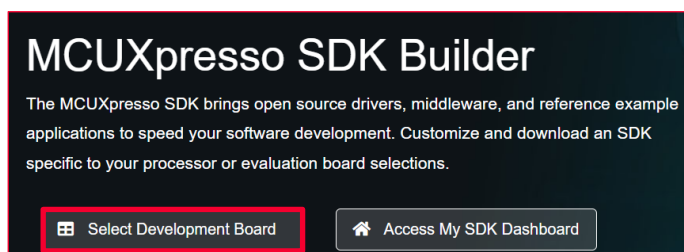
The steps to install DK6Programmer are given below.

1. Visit [MCUXpresso SDK Builder](#)  site and click **Select Development Board** as marked in **Figure 12**.



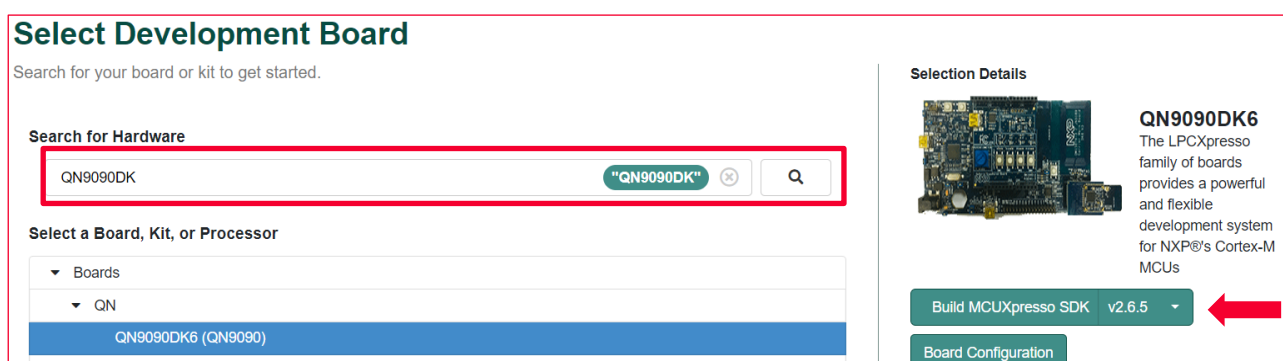
You may be required to sign in to NXP account.

Figure 12: Select Development Board



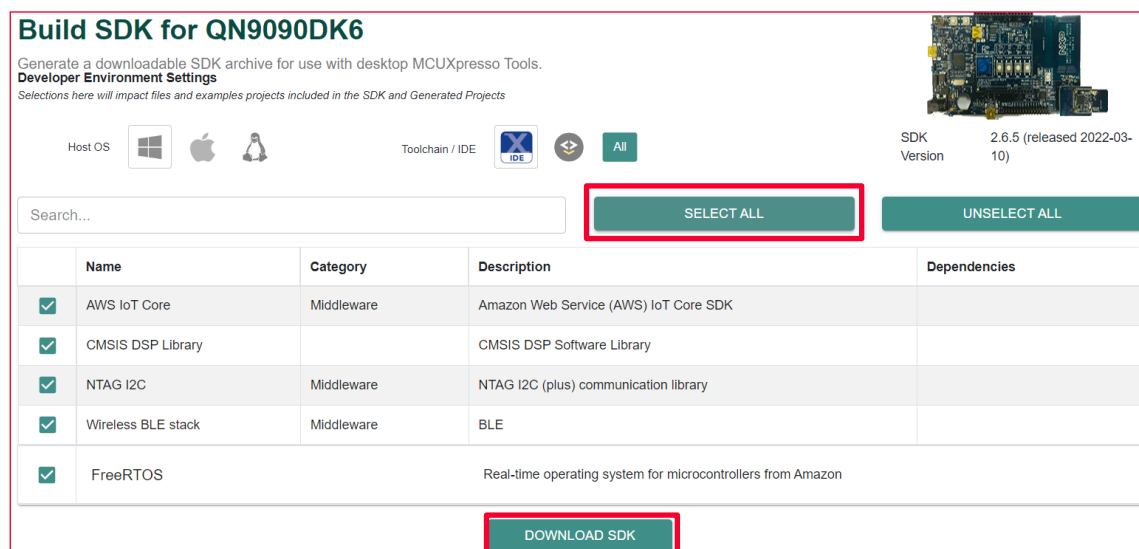
2. Type QN9090DK in Search for Hardware, then select QN9090DK6 under Boards (**Figure 13**). The selection details will be shown on the right part of the page.

Figure 13: Select SDK



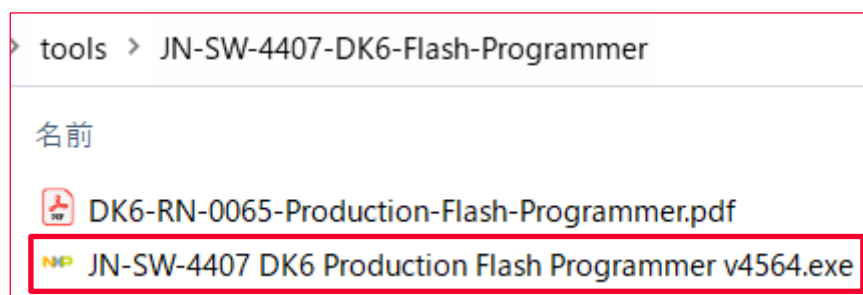
3. Click the **Build MCUXpresso SDK** button. The development environment setting fields will appear as shown in **Figure 14**.

Figure 14: Select SDK Components



- Click **Select All** and then click **Download SDK** (may need to accept the license). The SDK file will be downloaded as .zip file.
- After downloading, unzip the SDK zip file and run the installer (v4564.exe) in tools\JN-SW-4407-DK6-Flash-Programmer folder (**Figure 15**) and follow the instructions.

Figure 15: Run Installer



The DK6Programmer tool should be installed now.

4 Appendix B: How to Change the Baud Rate

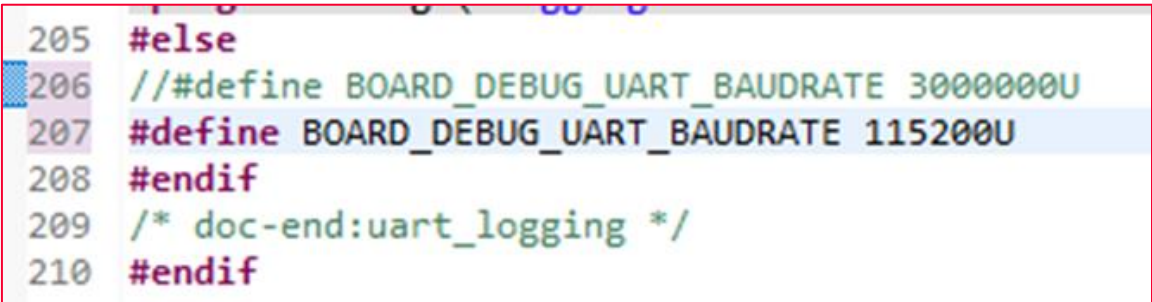
Starting with SDK v04.04.03 for Type 2BP, the baud rate for UART has been changed from 115200 bps to 3 Mbps.

The default setting is 3Mbps, but if you want to change to 115200 bps, the following changes need to be done.

4.1 Standalone Mode

- Change “BOARD_DEBUG_UART_BAUDRATE” in boards/Host/Rhodes4_SPI/board.h, as shown in **Figure 16**.

Figure 16: Baud Rate Change in Standalone Mode



```
205 #else
206 // #define BOARD_DEBUG_UART_BAUDRATE 3000000U
207 #define BOARD_DEBUG_UART_BAUDRATE 115200U
208 #endif
209 /* doc-end:uart_logging */
210 #endif
```

4.2 PnP Mode

- Change “DEMO_USART_BAUDRATE” in demos/pnp/Rhodes4/pnp_usart.c, as shown in **Figure 17**.

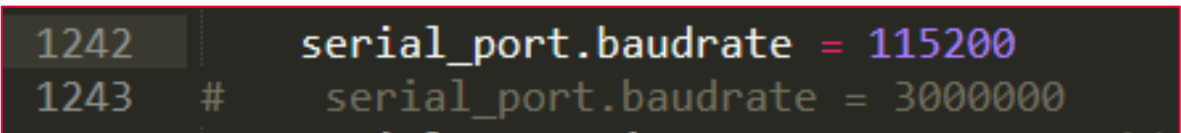
Figure 17: Baud Rate Change in PnP Mode (1 of 2)



```
78 // #define DEMO_USART_BAUDRATE 3000000
79 #define DEMO_USART_BAUDRATE 115200
```

- Change “serial_port.baudrate” in MTD-SCP-071-A_DS-TWR_SR150_Unicast_v04.04.03.py, as shown in **Figure 18**.

Figure 18: Baud Rate Change in PnP Mode (2 of 2)



```
1242 serial_port.baudrate = 115200
1243 # serial_port.baudrate = 3000000
```


5 Appendix C: COM Port Detection for EVK Revision 2.1


Check Device Manager → USB serial device → Property → Event: Information  for **MI_00** as shown in **Figure 19**. MI 00 (SCB0 in **Figure 20**) is connected to QN9090 UART. In this case, COM13 is the target of connection.

Figure 19: COM Port Detection for Revision 2.1 EVK

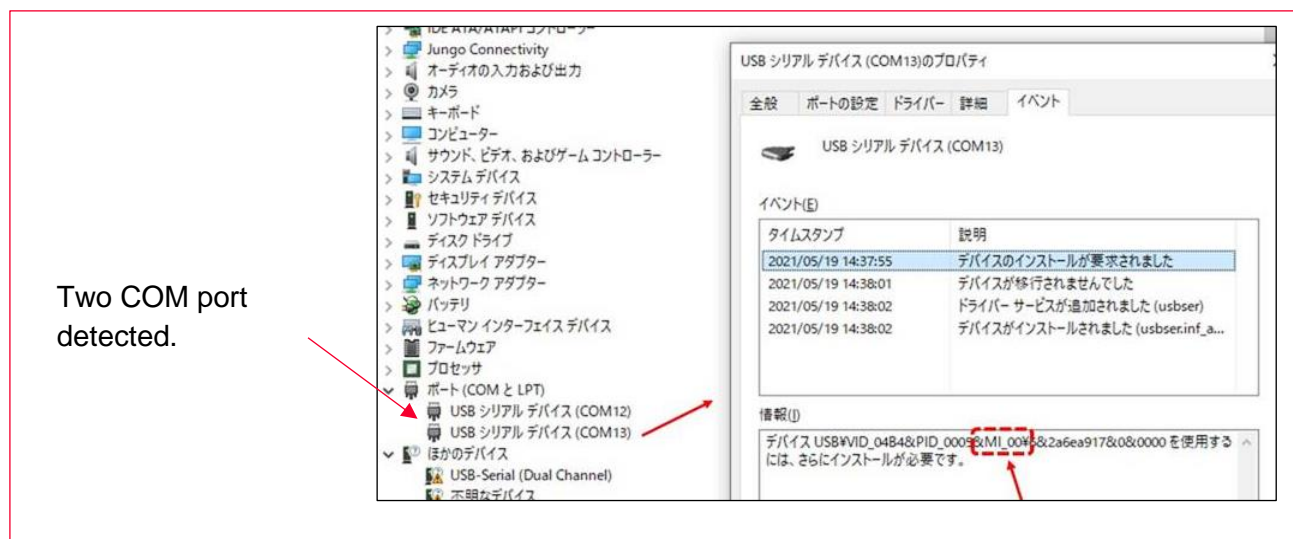


Figure 20: MI Connection with QN9090 UART

#	Part Number	SCB 0			SCB 1			MFG Interface
		Mode	Protocol	MI #	Mode	Protocol	MI #	
4	CY7C65215-32LTXI	UART	CDC	00	UART	CDC	02	04
		UART	CDC	00	UART / SPI / I2C / JTAG	Vendor / PHDC	02	03
		UART / SPI / I2C	Vendor / PHDC	00	UART	CDC	01	03
		UART / SPI / I2C	Vendor / PHDC	00	UART / SPI / I2C / JTAG	Vendor / PHDC	01	02

Revision History

Revision	Date	Author	Change Description
	Jul 29, 2021		Initial release
A	Aug 01, 2021		
B	Oct 01, 2021		
C	Oct 21, 2021		Add Debugger information
D	Nov 11, 2021		Change the Script file name
E	Jun 22, 2022		Add Appendix (DK6programmer information)
F	Oct 12, 2023		Add Appendix (How to change the baudrate)
G	Nov 06, 2023		Add Advance confirmation Update SDK v4.4.3
H	Mar 14, 2024		Update SDK v4.6.0 Change the new format



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