TMYTEK Box Series API Documentation

Introduction

TMYTEK Box Series API helps developing mmwave(n257 / n260) **beamforming** and **beam steering** applications with **BBox 5G Series(mmwave beamformer)** and **UDBox 5G Series(mmwave Up-down converter)**.

The .dll format release is windows shared library and test on visual studio community 2019 and labView 2019.

Every model has its own sample code. Please refer to the sample code inside each folder for the specific programming language.

[Product Video1] [Product Video2] [Product Video3]

Getting Started

- Sample Code Version : v1.5.1
- API Version: v3.3.15.16
- Release Date: August., 2022
- Latest Release : [Download Link]
- Overview
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- BBoxLite 5G Series API Usage
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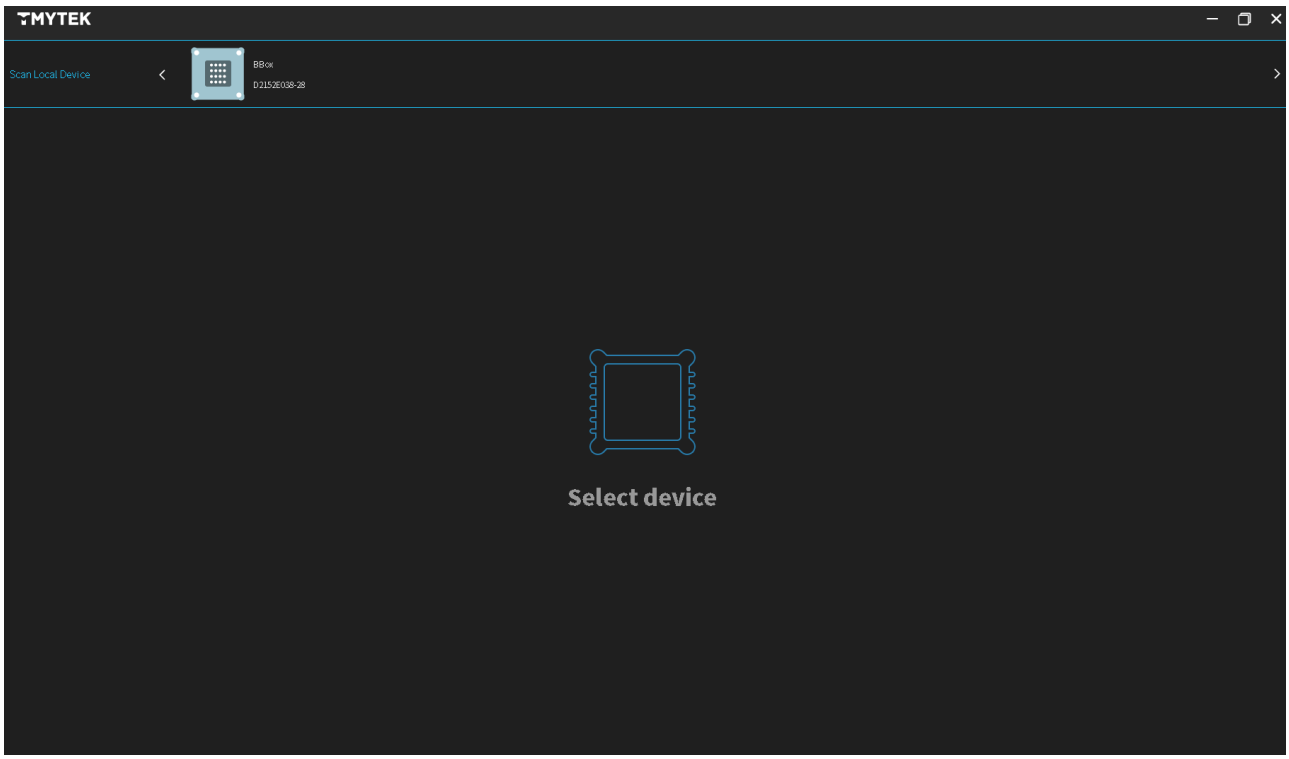
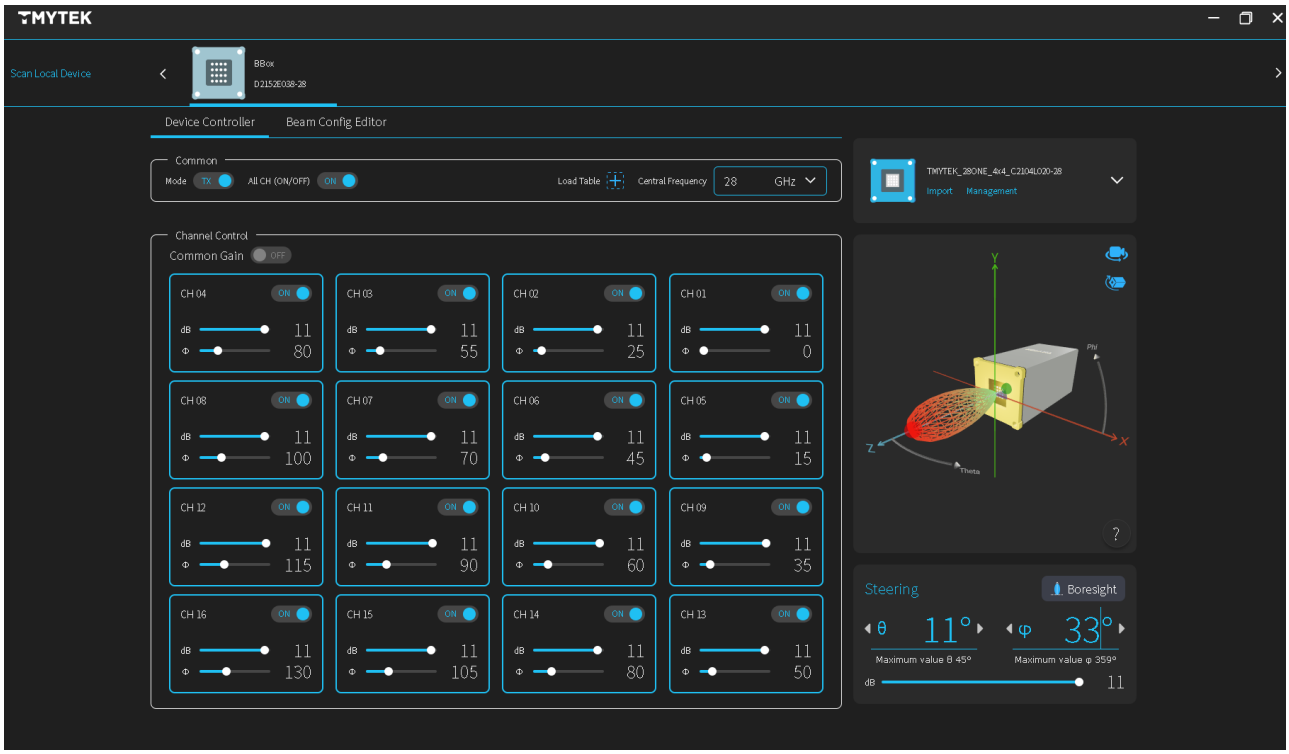
  - [setChannelGainPhase] : Set Device channel Gain and Phase settings
  - [setBeamAngle] : Set Device Beam Steering Angle
  - [getTemperatureADC] : Get Device RF board temperature adc value
- BBoxOne 5G Series API Usage
  - [switchChannelPower] : Set Device channel power on or off
  - [setChannelGainPhase] : Set Device channel Gain and Phase settings
  - [setBeamAngle] : Set Device Beam Steering Angle
  - [getTemperatureADC] : Get Device RF board temperature adc value
- UDBox API Usage
  - [GetState] : Get UDBox device settings
  - [SetState] : Set UDBox device settings
  - [Set Freq] : Set LO/RF/IF/Bandwidth in KHz

Prerequisites

Network settings

- Check network connection : Open TMXLAB Kit to make sure device can be connected

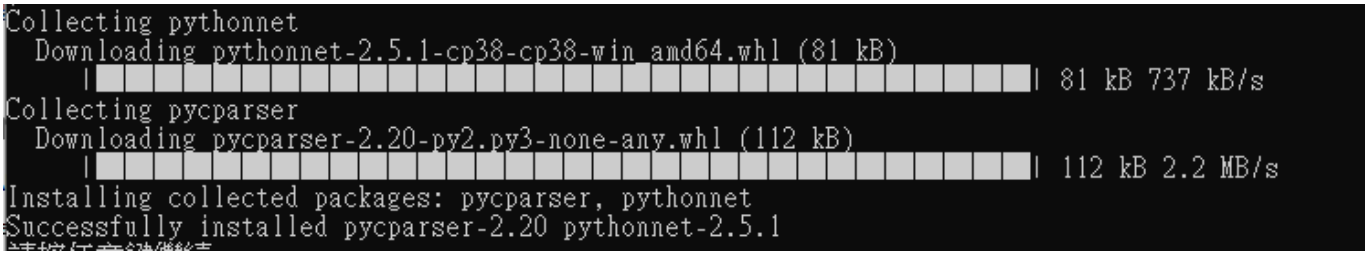




Python Environment Setup

- Python version : python-3.7.7 32-bit : [Download Link]
- External modules can be installed with Setup.bat in pre-install/

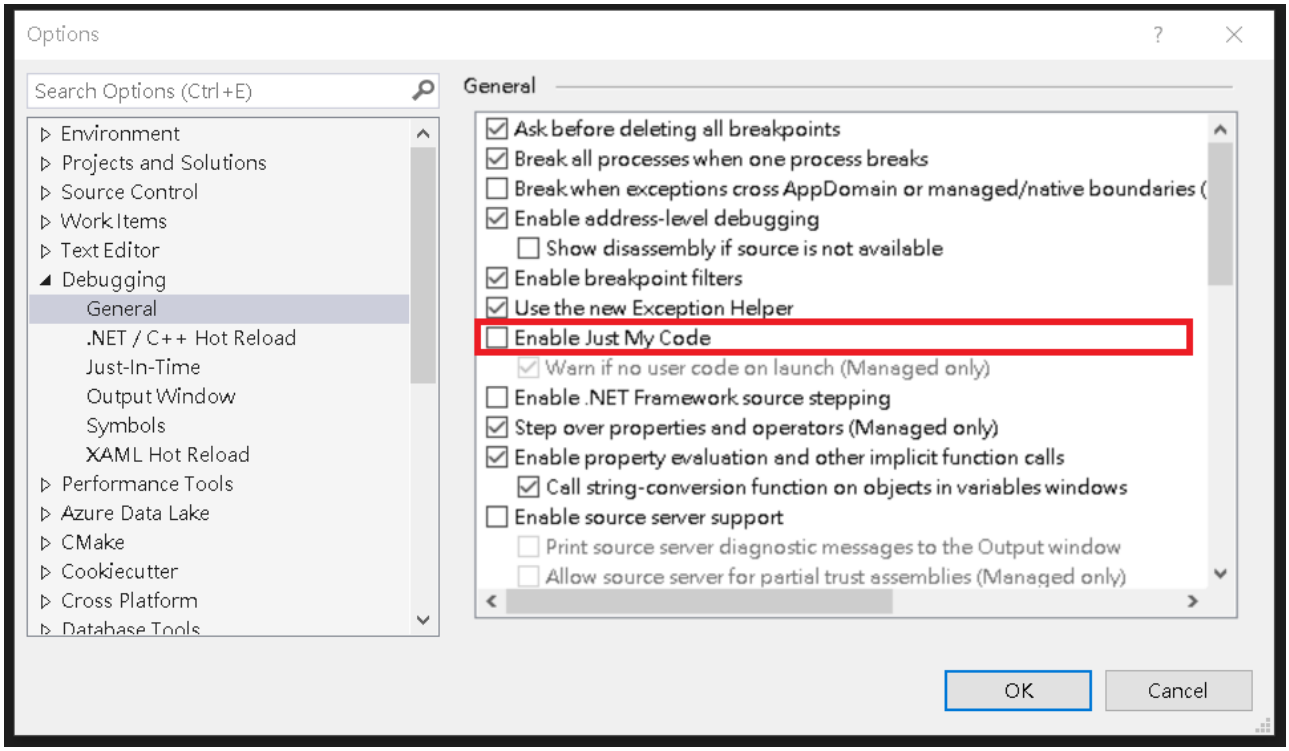
```
$ bbox-api\pre-install\Setup.bat
```



Visual C++ and Visual C# Environment

- Step 1 : Visual Studio version : 2019 community : [Download Link]

- Step 2 : Disable Visual_studio just my code : [Ref_Link]



- Final Step : BBoxLite 5G sample code : [Download Link]

```
DEMO1 : Switch TX Mode

DEMO2 : Channel 1 Power Off

DEMO3 : Channel Gain/Phase Control

DEMO4 : Device Beam Steering Control
```

Sample Code Description

Python

- BBoard 5G Series
- BBoxLite 5G Series
- BBoxOne 5G Series

C++

- BBoard 5G Series
- BBoxLite 5G Series
- BBoxOne 5G Series

C#

- BBoard 5G Series
- BBoxLite 5G Series
- BBoxOne 5G Series

Matlab

- BBoxOne 5G Series

Labview

- BBoxLite 5G Series
- BBoxOne 5G Series

BBox Series Common API Usage

ScanningDevice

Query the Active Devices Information on Ethernet

```
string[] ScanningDevice(DEV_SCAN_MODE scanMode)
```

Function definition

Param Type	Param Name	Param Value	Note
Integer (DEV_SCAN_MODE)	scanMode	0	Normal mode

Return Type	Name	Return Value	Note
string Array	Device Info	{ "D2104L011-28,192.168.100.111,9", "D2104L012-28,192.168.100.112,9" }	{ "Device1_SN,Device1_IP,Device1_type", "Device2_SN,Device2_IP,Device2_type" }

Init

Initialize the Default Device Settings

```
int Init(sn, dev_type, idx)
```

Function definition

Param Type	Param Name	Param Value	Note
string	sn	"D2104L011-28"	Serial Number from ScanningDevice return value
int	dev_type	9	Device Type from ScanningDevice return Device type value
int	idx	0	default value

Return Type	Name	Return Value	Note
Integer	Return Code	0	Status OK

getTxRxMode

Query Device Operating Mode

```
int getTxRxMode(string sn)
```

Param Type	Param Name	Param Value	Note
string	sn	"D2104L011-28"	Serial Number from ScanningDevice return value

Return Type	Name	Return Value	Note
Integer	Mode	1	Standby : 0, TX : 1, RX : 2

SwitchTxRxMode

Set Device Operating Mode

```
int SwitchTxRxMode(int mode, string sn)
```

Function definition

Param Type	Param Name	Param Value	Note
Integer	mode	1	Standby : 0, Tx : 1, Rx : 2
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
Integer	Return Code	0	Status OK

BBoard 5G Series API Usage

switchChannelPower

Set Device channel power on or off

```
string switchChannelPower(int board, int ch, int sw, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
int	sw	1	Channel On/Off : ON - 0 , OFF - 1
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
string	Return Status	"OK"	Status OK

setChannelPhaseStep

Set Device channel element phase step

```
int setChannelPhaseStep(int board, int ch, int phase_step, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
int	phase_step	0	Element Gain step in range(0, 15), 5.625 deg per step
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
int	Return Status	0	Status OK

setChannelGainStep

Set Device channel element gain step

```
int setChannelGainStep(int board, int ch, int gain_step, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
int	gain_step	0	Element Gain step in range(0, 15), 0.5db per step
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
int	Return Status	0	Status OK

setCommonGainStep

Set Device channel common gain step

```
int setCommonGainStep(int board, int ch, int gain_step, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
int	gain_step	0	Common Gain Step in range(0, 15)
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
int	Return Status	0	Status OK

getTemperatureADC

Get Device RF board temperature adc value

```
int[] getTemperatureADC(string sn)
```

Param Type	Param Name	Param Value	Note
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note

Return Type	Name	Return Value	Note
int[]	Board ADC	{0}	BBoard : Board_1 Temperature Sensor ADC Value

BBoxLite 5G Series API Usage

switchChannelPower

Set Device channel power on or off

```
string switchChannelPower(int board, int ch, int sw, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
int	sw	1	Channel On/Off : ON - 0 , OFF - 1
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
string	Return Status	"OK"	Status OK

setChannelGainPhase

Set Device channel Gain and Phase settings

```
string setChannelGainPhase(int board, int ch, double db, int phase, string sn)
```

Function definition

Param Type	Param Name	Param Value	Note
int	board	1	Board Number : 1
int	ch	1	Channel Number in range(1, 4)
double	db	10	db in dynamic range
int	phase	45	deg in range(0, 355, 5)
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note

Return Type	Name	Return Value	Note
string	Return Status	"OK"	Status OK

setBeamAngle

Set Device Beam Steering Angle

```
int setBeamAngle(double db, int theta, int phi, string sn)
```

Function definition

Param Type	Param Name	Param Value	Note
double	db	10	db in dynamic range
int	theta	15	Theta value in range(0, 45)
int	phi	180	Phi value 0 or 180
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
Integer	Return Code	0	Status OK

getTemperatureADC

Get Device RF board temperature adc value

```
int[] getTemperatureADC(string sn)
```

Param Type	Param Name	Param Value	Note
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
int[]	Board ADC	{0}	BBoxLite : Board_1 Temperature Sensor ADC Value

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BBoxOne 5G Series API Usage

switchChannelPower

Set Device channel power on or off

```
string switchChannelPower(int board, int ch, int sw, string sn)
```

Param Type	Param Name	Param Value	Note
int	board	1	Board Number in range(1, 4)
int	ch	1	Channel Number in range(1, 4)
int	sw	1	Channel On/Off : ON - 0 , OFF - 1
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
string	Return Status	"OK"	Status OK

setChannelGainPhase

Set Device channel Gain and Phase settings

```
string setChannelGainPhase(int board, int ch, double db, int phase, string sn)
```

Function definition

Param Type	Param Name	Param Value	Note
int	board	1	Board Number in range(1, 4)
int	ch	1	Channel Number in range(1, 4)
double	db	10	db in dynamic range
int	phase	45	deg in range(0, 355, 5)
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
string	Return Status	"OK"	Status OK

setBeamAngle

Set Device Beam Steering Angle

```
int setBeamAngle(double db, int theta, int phi, string sn)
```

Function definition

Param Type	Param Name	Param Value	Note
double	db	10	db in dynamic range
int	theta	15	Theta value in range(0, 45)
int	phi	180	Phi value in range (0, 180)
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
Integer	Return Code	0	Status OK

getTemperatureADC

Get Device RF board temperature adc value

```
int[] getTemperatureADC(string sn)
```

Param Type	Param Name	Param Value	Note
string	sn	"D2104L011-28"	Device Serial Number

Return Type	Name	Return Value	Note
int[]	Board ADC	{0,0,0,0}	BBoxOne : {Board_1, Board_2, Board_3, Board_4} Temperature Sensor ADC Value

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UDBox 5G Series API Usage

GetState

```
int GetState(int state_index, string sn)
```

Function definition

Param Type	Param Name	Param Value

Param Type	Param Name	Param Value
int	state_index	0: Lock 1: CH1 2: CH2 3: 10M output 4: 100M output 5: 100M source 6: LED 100M 7: 5V 8: 9V
string	sn	Device Serial Number

Return Type	Name	Return Value	Note
Integer	Return state	0	state_index

SetState

```
int SetState(int state_index, int value, string sn)
```

Function definition

Param Type	Param Name	Param Value
int	state_index	0: Lock 1: CH1 2: CH2 3: 10M output 4: 100M output 5: 100M source 6: LED 100M 7: 5V 8: 9V
int	value	value
string	sn	Device Serial Number

return state from the state_index

Return Type	Name	Return Value	Note
Integer	Return state	0	state_index

Set Freq

```
string SetUDFreq(double freq_ud, double freq_rf, double freq_if, double
freq_bandwidth, string sn)
```

Function definition

Param Type	Param Name	Param Value
double	freq_ud	UD/LO frequency(KHz)
double	freq_rf	RF frequency(KHz)
double	freq_if	IF frequency(KHz)
double	freq_bandwidth	Bandwidth frequency(KHz)
string	sn	Device Serial Number

Return Type	Name	Return Value	Note
Integer	Return Code	0	Status OK