

## PLTBEITO SIG mesh uart protocol

--- Suzhou Pairlink Network Technology Ltd.,

**CONFIDENTIAL**

Version	History	Remark
0.0.1	First release	
0.0.2	Add uart sampe data	
0.0.3	Add for gateway/normal case	3.3.7, 4.4.3, 4.4.4, 4.4.5
0.0.4	Broadcast addr 0xffff->0xc000	
0.0.5	Add ctl/hsl related	remove src in [3.5.6]
Q&A window	cai.yi@pairlink.com.cn	

## 目录

PLTBEITO SIG mesh uart protocol.....	1
1. Feature.....	4
2. Status Flow of PLTBEITO-x.....	5
3. UART Control.....	6
3.1 UART configuration.....	6
3.2 UART Packet format.....	6
3.3 UART packet -- Command.....	7
3.3.1 Command Opcode: Enable/Disable mesh[0x01].....	7
3.3.2 Command Opcode: Send User data to mesh[0x02].....	7
3.3.3 Command Opcode: Reset[0x03].....	7
3.3.4 Command Opcode: Get Device Info[0x04].....	8
3.3.5 Command Opcode: Send data to phone[0x05].....	8
3.3.6 Command Opcode: Send Generics data to mesh[0x06].....	8
3.3.7 Command Opcode: Set mode[0x07].....	9
3.3.8 Command Opcode: Set Local Standard SIG Related status[0x08].....	9
3.4 UART packet -- Response.....	10
3.4.1 Response Error Code.....	10
3.5 UART packet -- Event.....	11
3.5.1 Event opcode: System Ready[0x01].....	11
3.5.2 Event opcode: Mesh Status Change [0x02].....	11
3.5.3 Event opcode: Connection Status [0x03].....	11
3.5.4 Event opcode: Receive User Data[0x04].....	11
3.5.5 Event opcode: Receive Phone Data[0x05].....	12
3.5.6 Event opcode: Receive Standard SIG Related Data[0x06].....	12
3.5.7 Event opcode: Factory Reset Triggered[0x07].....	12
3.5.8 Event opcode: SET HSL, RGB OUTPUT[0x08].....	12
4. Sample.....	13
4.1 Power up.....	13
4.1.1 Not in mesh.....	13
4.1.2 Already in mesh.....	13
4.2 Enable ble.....	13
4.2.1 Enable ble with Pairlink advanced SIG mesh nodes add function disable.....	13
4.2.2 Enable ble with Pairlink advanced SIG mesh nodes add function enable.....	13
4.2.3 Disable ble.....	13
4.2.4 This command is useless if the device is in mesh status(Mesh status Bit15=1).....	13
4.3 Device be added into mesh by phone.....	14
4.3.1 SIG mesh nodes add procedure.....	14
4.3.2 Pairlink advanced SIG mesh nodes add procedure.....	14
4.4 Send user data.....	14
4.4.1 Send.....	14
4.4.2 Receive.....	14
4.4.3 Normal device receive gateway's query data.....	15

- 4.4.4 Normal device send response data..... 15
- 4.4.5 Gateway receive response data.....15
- 5. Standard SIG data.....16
- 5.1 CTL model.....16
- 5.1.1 Receive CTL set (opcode = 0x825e), [3.5.6].....16
- 5.1.2 Change CTL status(opcode = 0x8260), [3.3.8]..... 16
- 5.2 HSL model..... 17
- 5.2.1 Receive HSL set and output (opcode = 0x825e), [3.5.6]..... 17
- 5.2.2 Receive HSL set, convert to RGB and output[3.5.8].....17
- 5.2.3 Change HSL status(opcode = 0x8278), [3.3.8].....17

CONFIDENTIAL

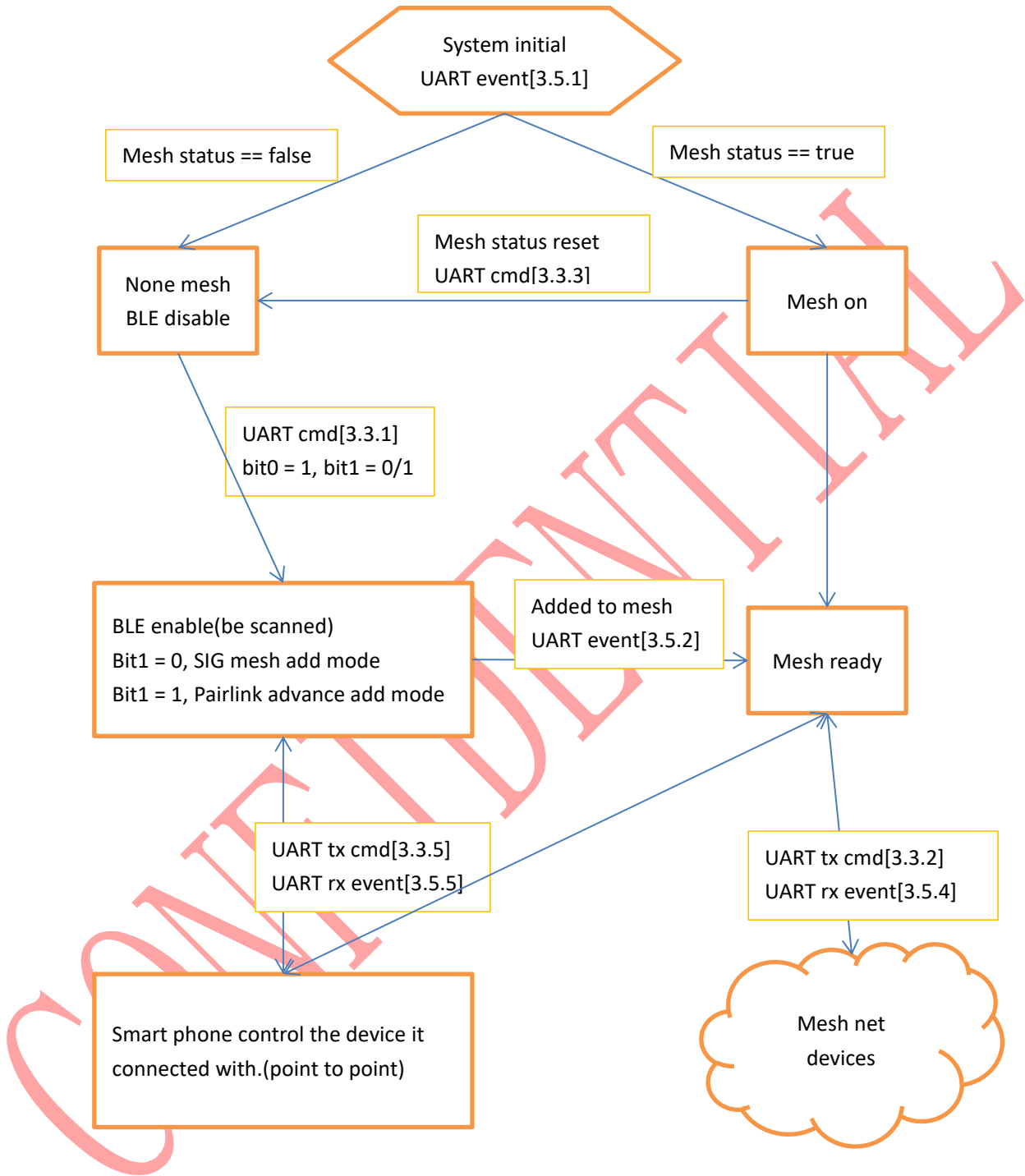
## 1. Feature

Pairlink PLTBEITO-x is one standard product designed for IoT products.

It supports SIG mesh, and this protocol is for user to implement MCU -- UART -- SIG mesh net.

CONFIDENTIAL

## 2. Status Flow of PLTBEITO-x



### 3. UART Control

#### 3.1 UART configuration

NO	NAME	CONFIG
1	Baud Rate	115200
2	Data Bit	8 bits
3	Stop	1 bit
4	Parity Bit	None

#### 3.2 UART Packet format

LSB					MSB
Header	Type	Length	Opcode	Parameters	Checksum

<b>Header (1 Byte)</b>	0x77
<b>Type (1 Byte)</b>	Type of Packet 0xB1: Command 0xB2: Reserved 0xB3: Response 0xB4: Event
<b>Length (1 Byte)</b>	Length of OpCode + Parameters
<b>OpCode (1 Byte)</b>	Operation code of this packet
<b>Parameters</b>	Data payload of each OpCode
<b>Check_XOR (1 Bytes)</b>	Check the packet validity <b>Check_XOR</b> = Header ^ Type ^ Length ^ OpCode ^ Parameters

### 3.3 UART packet -- Command

Command packets are defined for MCU to send to PLTBEITO-x.

#### 3.3.1 Command Opcode: Enable/Disable mesh[0x01]

After system boot up, if PLTBEITO-x is not in mesh status, the BLE is disabled in default. MCU should send this command to enable PLTBEITO-x BLE into advertising.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	03	01	Enable(uint16)	variable

Enable:

Bit0: 0/1, disable/enable BLE advertising. If the PLTBEITO-x is in mesh status, this command is invalid.

Bit1: 0/1, disable/enable Pairlink advanced SIG mesh nodes add function.

Other bits, RFU.

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	01	Err	variable

#### 3.3.2 Command Opcode: Send User data to mesh[0x02]

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	n	02	Dst, Data[]	variable

Dst(2 bytes) is the destination device's mesh net address, unicast or group address, 0xc000 is broadcast address.

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	02	Err	variable

#### 3.3.3 Command Opcode: Reset[0x03]

Reset to factory status. Mesh net would be cleared after this command proceed.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	01	03	N/A	C4

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	03	Err	variable

### 3.3.4 Command Opcode: Get Device Info[0x04]

MCU to get PLTBEITO-x's status.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	01	04	N/A	C3

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	0D	04	Mesh status, FW version, Local Address	variable

Mesh status(2byte):

Bit0: 0/1, BLE advertising is disable/enable

Bit1: 0/1, Pairlink advanced SIG mesh nodes add function is disable/enable

Bit15: 0/1, SIG mesh is enable/disable

Other bits, RFU.

FW version(4 bytes): Firmware version of PLTBEITO-x;

Local address(6bytes): BD\_ADDR of PLTBEITO-x.

### 3.3.5 Command Opcode: Send data to phone[0x05]

MCU send data to the smart phone, which directly connecting with the PLTBEITO-x. The data length is 20 bytes in maximum.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	n	05	Data[]	variable

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	05	Err	variable

### 3.3.6 Command Opcode: Send Generics data to mesh[0x06]

MCU send data to the mesh net nodes.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	n	06	Dst,Opcode, Data[]	variable

Dst(2 bytes) is the destination device's mesh address, unicast or group address

Opcode and data, pls refer to the spec of

(<https://www.bluetooth.com/specifications/mesh-specificationsMesh Model Specification 1.0>)

The current support default opcode: 0x8218(PowerLevel status), data-2byte level

Other opcode should be customized added. Pls contact with Pairlink for technical support.

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	06	Err	variable



### 3.3.7 Command Opcode: Set mode[0x07]

MCU send this to set work mode. There are two work modes: Gateway mode and normal mode. Only device in gateway mode can be configured by phone to query data periodically.

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	02	07	mode	variable

Mode = 0, normal mode.

Mode = 1, gateway mode.

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	07	Err	variable

### 3.3.8 Command Opcode: Set Local Standard SIG Related status[0x08]

MCU send data to change local node's SIG related status

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	n	08	Opcode,Data[]	variable

Only support CTL/HSL related opcode now, see more in chapter 5.

Other opcode should be customized added. Pls contact with Pairlink for technical support.

Response					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B3	02	08	Err	variable

### 3.4 UART packet -- Response

Response packet could be considered as ACK for the command packet.

When one command packet is sent to PLTBEITO-x, there is one response packet sent back to MCU.

The response packet is dedicated to the command package.

#### 3.4.1 Response Error Code

1) Error Code

Value	Comment
0x00	ERR_NONE
0x01	ERR_LENGTH_FAIL
0x02	ERR_INVALID_FAIL
0x03	ERR_UNKNOWN_CMD
0x04	ERR_DISCONNECTED
0x05	ERR_STATE
0x06	ERR_GENERIC_OP_UNSUPPORTED
0x07	ERR_GENERIC_DATA_MISMATCH

### 3.5 UART packet -- Event

Event packet is sent to MCU from PLTBEITO-x, to notify MCU that there is event or data triggered in the PLTBEITO-x side.

#### 3.5.1 Event opcode: System Ready[0x01]

PLTBEITO-x is initialed. This event packet would be sent to MCU after PLTBEITO-x system boot up.

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	0D	01	Mesh status, FW version, Local Address	variable

Mesh status(2bytes): refer to 3.3.4  
 FW version(4 bytes): firmware version  
 Local address(6bytes): BD\_ADDR

#### 3.5.2 Event opcode: Mesh Status Change [0x02]

PLTBEITO-x's mesh status is changed. This event would be triggered when PLTBEITO-x is added/deleted from mesh net.

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	02	02	Para	variable

Parameters: 0x00, deleted from mesh net.  
 0x01, added into mesh net.

#### 3.5.3 Event opcode: Connection Status [0x03]

PLTBEITO-x is connected or disconnected by smart phone directly.

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	02	03	Para	variable

Parameters: 0x00, disconnected with cell phone.  
 0x01, connected by cell phone.

#### 3.5.4 Event opcode: Receive User Data[0x04]

Receive user data from mesh net.

Event					
Header	Type	Length	Opcode	Parameters	Checksum
77	B4	n	04	Src, Data[]	variable

Src(2 bytes), the mesh address of the data source. MCU could send data back to the source device with UART command[0x02]  
 Data[], user data stream.

### 3.5.5 Event opcode: Receive Phone Data[0x05]

Receive user data(not mesh data) from cell phone which is connecting with the PLTBEITO-x directly.

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	n	05	Data[]	variable

### 3.5.6 Event opcode: Receive Standard SIG Related Data[0x06]

Receive standard SIG mesh data from mesh net.

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	n	06	Opcode,Data[]	variable

Parameters:

Only support CTL/HSL related opcode, see more in chapter 5.

**Other opcode should be customized added. Pls contact with Pairlink for technical support.**

### 3.5.7 Event opcode: Factory Reset Triggered[0x07]

Customized, use a pin to trigger factory reset .

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	01	07	N/A	C5

### 3.5.8 Event opcode: SET HSL, RGB OUTPUT[0x08]

When have HSL model, can customize output rgb value .

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	07	08	R,G,B (2,2,2bytes)	variable

## 4. Sample

### 4.1 Power up

#### 4.1.1 Not in mesh

Receive: 77 B4 0D 01 00 00 04 00 01 00 F0 AC D7 00 30 01 70 [3.5.1]

0x0000: mesh status 0000(Ble disable, Pairlink advanced SIG mesh nodes add function disable,SIG mesh disable)

0x0004 firmware version - product id

0x0001 firmware version - version id

F0 AC D7 00 30 01 Local ble address

Need 4.2.1 or 4.2.2 to let device run.

#### 4.1.2 Already in mesh

Receive: 77 B4 0D 01 00 80 04 00 01 00 F0 AC D7 00 30 01 F0

0x8000: mesh status bit15 = 1

No need 4.2, device is already running

### 4.2 Enable ble

#### 4.2.1 Enable ble with Pairlink advanced SIG mesh nodes add function disable

Send: 77 B1 03 01 01 00 C5[3.3.1]

Receive: 77 B3 02 01 00 C7

#### 4.2.2 Enable ble with Pairlink advanced SIG mesh nodes add function enable

Send: 77 B1 03 01 03 00 C7

Receive: 77 B3 02 01 00 C7

#### 4.2.3 Disable ble

Send: 77 B1 03 01 00 00 C4

Receive: 77 B3 02 01 00 C7

#### 4.2.4 This command is useless if the device is in mesh status(Mesh status Bit15=1)

Receive: 77 B3 02 05 00 C7 (ERR\_STATE)

### 4.3 Device be added into mesh by phone

#### 4.3.1 SIG mesh nodes add procedure.

Receive: 77 B4 02 03 01 C3 [3.5.3 connected]

Receive: 77 B4 02 02 01 C2 [3.5.2 added into mesh]

Receive: 77 B4 07 06 02 00 17 82 00 00 55 [3.5.6 powerlevel set by device itself]

0x000C: device mesh unicast address

0x8217: PowerLevel set Unacknowledged

0x0000: power level value

Receive: 77 B4 02 03 00 C2 [3.5.3 disconnected]

Smart phone need to reconnect after device is added into mesh

Receive: 77 B4 02 03 01 C3 [3.5.3 connected]

Wait phone hint config OK, then can use mesh function.

#### 4.3.2 Pairlink advanced SIG mesh nodes add procedure.

Receive: 77 B4 0D 01 00 80 04 00 01 00 F0 AC D7 00 30 01 F0

System will reboot after added into mesh.

This event is similar to 4.1, only difference is mesh status bit15 = 1

Receive: 77 B4 07 06 02 00 17 82 00 00 55[3.5.6 powerlevel set by device itself]

Receive: 77 B4 02 03 01 C3 [3.5.3 connected]

User can use mesh function.

### 4.4 Send user data

#### 4.4.1 Send

Send: 77 B1 0d 02 ff 7f 00 11 22 33 44 55 66 77 88 99 58

0x7fff : phone default mesh address

Phone will receive data "00112233445566778899"

#### 4.4.2 Receive

User phone send data, and the device will send uart event 3.5.2

Receive: 77 B4 15 04 FF 7F 11 22 33 44 55 66 77 88 99 11 22 33 44 55 66 77 88 99 52

0x7fff : phone default mesh address

11 22 33 44 55 66 77 88 99 11 22 33 44 55 66 77 88 99: data

#### 4.4.3 Normal device receive gateway's query data

Device work in normal mode will receive gateway query data periodically.

Receive: 77 B4 04 04 05 00 00 c6

0x0005 : source address(gateway' address)

0x00: sub opcode, means this is gateway's query data.

#### 4.4.4 Normal device send response data

Mcu should send command like this to response

In 4.4.3, source address is 0x0005, so set dst address to 0x0005 to response

Send: 77 B1 0d 02 05 00 01 11 22 33 44 55 66 77 88 99 dc

0x0005 : dst address(gateway's address)

0x01: sub opcode, means response data.

112233445566778899: response data.

#### 4.4.5 Gateway receive response data

Receive: 77 B4 0d 04 0a 00 01 11 22 33 44 55 66 77 88 99 d0

0x000a : source address(normal device' address), can be ignore.

0x01: sub opcode, means response data.

112233445566778899: response data.

## 5. Standard SIG data

This is Detailed description of [3.3.8] and [3.5.6]

Set Local Standard SIG Related status[3.3.8]

Command					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B1	n	08	Opcode,Data[]	variable

Receive Standard SIG Related Data[3.5.6]

Event					
Header	Type	Length	Opcode	Parameters	Check_XOR
77	B4	n	06	Opcode,Data[]	variable

### 5.1 CTL model

#### 5.1.1 Receive CTL set (opcode = 0x825e), [3.5.6]

This event will occur when node receive ctl set from ctl client.

Data is follow Spec 'Mesh Model' 6.3.2.2 's lightness and temperature.

CTL Temperature is range from 0x0320-0x4e20, see Spec 'Mesh Model' 6.1.3.1

Field	Size (octets)	Notes
CTL Lightness	2	The target value of the Light CTL Lightness state.
CTL Temperature	2	The target value of the Light CTL Temperature state.

e.g.

77 B4 07 06 5E 82 64 57 20 03 0E

Opcode = 0x825e

Lightness = 0x5764 = 22732

Temperature = 0x 0320 = 800

#### 5.1.2 Change CTL status(opcode = 0x8260), [3.3.8]

When CTL status is changed not by SIG mesh(e.g. change by physical button), mcu need send this to change node's CTL status.

e.g.

77 B1 07 08 6082 1111 2222 2B

Opcode = 0x8260

Lightness = 0x1111 = 4369

Temperature = 0x2222 = 8738



## 5.2 HSL model

When receive hsl set, can choose output as 5.2.1 or 5.2.2

### 5.2.1 Receive HSL set and output (opcode = 0x825e), [3.5.6]

Data is follow Spec ‘Mesh Model’ 6.3.3.2 ‘s lightness , hue and saturation.

Field	Size (octets)	Notes
HSL Lightness	2	The target value of the Light HSL Lightness state
HSL Hue	2	The target value of the Light HSL Hue state
HSL Saturation	2	The target value of the Light HSL Saturation state

e.g.

77 B4 09 06 76 82 00 80 B9 A5 69 A9 64

Opcode = 0x8276

Lightness = 0x8000 = 32768

Hue = 0xa5b9 = 42425

Saturation = 0xa969 = 43369

### 5.2.2 Receive HSL set, convert to RGB and output[3.5.8]

e.g.

77 B4 07 08 F5 B8 5F 57 09 47 C7

R = 0xb8f5 = 47349

G = 0x575f = 22367

B = 0x4709 = 18185

### 5.2.3 Change HSL status(opcode = 0x8278), [3.3.8]

When HSL status is changed not by SIG mesh(e.g. change by physical button), mcu need send this to change node’s HSL status.

e.g.

77B1 09 08 7882 1111 2222 3333 3d

Opcode = 0x8278

Lightness = 0x1111 = 4369

Hue = 0x2222 = 8738

Saturation = 0x3333 = 13107